THE

# Practical Teacher

*A MONTHLY EDUCATIONAL JOURNAL*

Edited by JOSEPH HUGHES.

'*Knowledge is proud that he has learned so much,*
*Wisdom is humble that he knows no more.*'—COWPER.

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## The Teacher's Health.

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### THE EYES—(*continued*).

THE troublesome affection to which the term *Stye* is applied has been dealt with in 'School Surgery,' in connection with the subject of skin diseases.

Occasionally the glands called Meibomian, which are placed in a row at the edges of the lids and at the roots of the eyelashes, appear to take on a chronic inflammatory state and cause the condition to which the term 'blear-eyed' is applied in some districts. It is often commenced by a succession of styes, which are minute abscesses in the glands, and which have been irritated by improper applications; or it has been caused by a continuous residence in an atmosphere loaded with irritating particles; but the causes being removed and the general health attended to, in most instances, the effect will cease.

It must not be forgotten that varieties of disturbances of sight arise in connection with general health, and that it does not necessarily follow that the sight itself is in danger of being lost, because of the want of power to accommodate the eye to the different positions in which the body is placed as regards the object looked at. A difference in the focussing power of the two eyes is not uncommon, just as there is more power at one time than at another in different sets of muscles, as we find when the back and the spinal column becomes twisted and contorted to one side or the other from habit; so one or other of the six muscles which act upon the eyeball, or one of those which act upon the eyelids, may become the subject of sudden spasms, or they may lose some of their power and be partially or completely paralysed. The differences in focussing power lead to alteration of sight in one or both eyes, one eye may be long-sighted the other short-sighted, or there may be an irregular action produced upon the ball, by which the position of the lens is altered, and correct vision interfered with. The structure of the eye has been imitated by man in the formation of the telescope and microscope, and a knowledge of the structure of these instruments may assist in making us understand the structure of the eye. The focussing power is in the muscular apparatus and the fluids of the eyeball, which are pressed upon by the muscles. The change in the length of the ray of light is regulated by the muscles. Irregular action in those muscles by interfering with perfection of adaptation destroys for the time being the efficiency of the organ, just as an opera-glass is put out of gear by unequal object-glasses.

A paralysis of one or more muscles sometimes follows upon diphtheria or some other blood malady. Such conditions are removable by healthy change and a properly arranged plan of treatment. The paralysis may be the '*avant courier*' which ushers in apoplexy. There is a *squint* or double vision, which is caused by rupture of a small vessel in the centre of the base of the brain. The minute vessel continues to bleed into the tissue of the brain, until a pressure is exerted on an increased area, and the patient lapses into unconsciousness and dies. A squint may be due to some external irritation, as teething, or to a gastric disturbance. This form is common among young children, and when observed should be treated on scientific principles instead of being altogether neglected, (as is but too often the case,) until convulsion arises. When the external muscles which regulate the position of the eyeball are out of harmony, the images which fall on the retina (the sensitive membrane of the eye) do not correspond: there is double vision, and to avoid the discomfort of that effect children learn to squint so that the image upon the retina of the eye which has the weaker muscle is suppressed; ultimately the vision in the squinting eye is much impaired. The constant strain increases short sight, though occasionally the opposite condition arises; the former holds when the squint is internal, that is, when the muscles which move the eye converge towards the median line. It gradually arises when small objects are held closer and closer to the face.

The weakness of focussing power may occur in young people in consequence of general debility, such as arises after depressing illnesses and overstrain. It is very necessary to avoid using the eyes upon minute work after such misfortunes, such use being likely to set up conditions similar to those which belong to 'old sight,' but in true old sight it is the lens which has lost some of its focussing power, whilst in the case referred to it is the muscular system which is at fault.



BRITISH MUSEUM

Spasm or cramp may arise in the optic muscles as well as in other parts of the muscular system, and cause derangements of sight, which may be temporary only, though when they are not recognised as such they give rise to serious and unnecessary apprehensions.

This brings me to the most important part of the subject in connection with school life, viz., defective vision and the effects of school life on the sight. The various terms which are applied to interference with vision are old sight, or *Presbyopia*, long sight, or *Hypermetropia*, short sight, or *Myopia*, and *Astigmatism*, or an alteration in the uniformity of the curvature of the cornea, by which its spherical shape is lost, and it becomes more or less conical. Children suffer in various ways and from various causes from these conditions, independently of those changes which arise in the ball of the eye from interference with its nutritive or its absorbent power. The requirements of civilised life have much to answer for in this respect. The anxiety of an over-careful mother, because her little one fails to see objects very clearly at a short distance from the eye, causes her to take the child to 'an oculist,' as he is termed, who gratifies the mother by putting on a pair of spectacles, by which the short sight is rectified or the long sight corrected, and the mother goes home delighted with Mr. So-and-So as being almost a magician. Her child now sits down at the piano, and plays away to her heart's content, and perpetuates the mischief, which really required abstinence from such work for its cure. This is altogether wrong; no effort is made to rectify the constitutional fault. The weak muscle, instead of being gradually strengthened, is left to its weakness, and spectacles probably become necessities for that child to the end of its career, or until some change takes place by which the other muscles are equally reduced in tone, and the difference of focussing power is removed. By this time, however, spectacles have become parts of the constitution, and the child (now grown up) cannot get on without them. It was stated not long ago in the *Times*, on the authority of an eminent ophthalmic surgeon, that 'our public schools are manufacturing a race of short-sighted people;' I do not agree with this dictum as regards the manufacture itself, because, as a rule, public school life is that which is more conducive to its prevention than that which holds in a large number of private schools. Still, it is a fact that the coverings which make up the eyeball in the child are not all alike as to their natural firmness of texture. It may therefore follow that a child whose fibrous tissues are weak, and the eyes extensible at the back, will keep a book nearer to the eye than another and a stronger boy. The muscles are put upon a strain; the ball of the eye yields and becomes elongated from before backwards; the lens is pressed nearer to the cornea, and short sight is increased. The book gradually gets nearer and nearer, and mischief to the eye is made permanent. The ordinary influences of school life are especially hurtful to this state. The eyes are employed for long periods over books which are often badly printed, or printed in a type which is much too small and difficult to see. The light of the room is very often defective, and the position occupied by the child gets cramped from habit, so that the muscular weakness is increased by it. One set of muscles are strained or over-taxed, another set are put out of use altogether, and thus gradually lose a part of the power which naturally belonged to them. English schools are not the greatest offenders. It has been noted that at gatherings of scientific men, such as that which took place in London in 1881 at the meeting of the International Medical Congress, that the French and German medical men, as a rule, used spectacles, whilst with English physicians it was the exception. It is said that the same fact is patent wherever learned men assemble on the Continent. Continental book-worms have taken to glasses in early life much more generally than English literati. The attention of sanitarians has been called to this, both at home and abroad. It has been imputed to the faulty construction of the seats and desks in our schools, the bad habits of the child student whilst reading or writing, the desks being too low, or the seats too far removed from the desks, forms only being used when the seats ought to be provided with rests at the back; or they are so placed that the eyes of the children are brought into too close proximity to the object, and in an oblique instead of a straight line. Habit has led to a curve in the spine from sitting on one hip, or leaning the arm upon the desk, and bringing the eyes to a focus whilst the book or paper is placed on an irregular or oblique base, and thus the muscles of the eyeball are unequally strained. It has been found from actual inspection that the majority of short-sighted children have lateral curvatures in the spine. The spinal column ought to have a straight outline on both the right and the left sides of it, the curves being restricted so as to accommodate themselves to the cavities of the body, and be only from before backwards, or *vice versâ*. It has been seen that the column bends to the right or left, according to the custom of the child to lean on one arm at the desk, or to twist one shoulder forward before the other, by which means the muscles on that side are brought into more forcible action, becoming stronger than their antagonists. The child sometimes has been allowed to get into the habit of standing on one leg, by which the corresponding hip is raised to a higher level than the other side, and a compensating curve is brought about in the dorsal region, by which the tendency to lean over to the other side is rectified. The association of short sight and lateral curvature has been clearly made out by *Cohn*, of Breslau, as well as by observers in America, and also in the United Kingdom. Short sight has been clearly associated with anything which tends to increase muscular or osseous debility. The cure for this condition ought not to be spectacles, but regular use of muscles and alteration of muscular custom. Our object should be alteration of habit, improvement of general health, and as much disuse of the over-used muscles as can be brought about by a pleasant kind of exercise. Teachers and managers must keep this point in view. Spines with lateral curvations are becoming very common in this country, especially among girls, and are much too often associated with spectacles. This association enables the teacher to go on with his teaching duty as regards books, but lets the more important point of muscular development be in abeyance. Glasses save trouble to the teacher, but perpetuate the muscular irregularity, and but too often lead to permanent debility. If we could follow these cases in after life, and see the misfortunes which happen to them from this prostitution of one faculty to overwork with the effect of permanent injury to another, we might hope for amelioration. A school in which there are a great number of short-sighted children has something wrong either in position and condition

of seats and desks, or in the arrangements of light, or the customs of the school as to ventilation and exercise, and calls for serious enquiry on the part of the managers. Children with short sight should read together, and should be drilled into the use of those muscles which regulate distance. They should be encouraged to use those which are defective, and not to put them still further out of use, and every effort should be made to compensate for the increased vigour of those which have been used too much, as compared with their antagonists. Not only should this rule be used as to study in school, but these children should be classed together out-of-doors, so that the exercises may be in accord. Those with lateral curvature, when the curve is caused by bad habit, should have that habit corrected by an enforced exercise of the weakened muscles, as by insisting upon battledore and shuttle-cock with the right hand tied behind the back, so as to bring into more active use the left arm and the corresponding series of dorsal muscles. The skipping-rope should be used afterwards for a few minutes to bring both sets into accord. If the habit has been a left-handed one the opposite action should be encouraged. The offending optic muscles should be encouraged to equal action by looking at objects placed at a given distance, and being made to recede in a straight line, whilst the position of the child when at work which requires the steady use of the eyes should be rigidly regulated; the shoulders kept in a parallel line, the elbows to the sides, the back upright, and the line of the paper or book upon the desk parallel with the line of the shoulders, the seat itself being regulated according to the length of the back of the worker. Tall children should work with tall children, and short ones with short ones, or else the height of the desk must be made to vary according to stature. The feet should rest upon the ground, so that there must also be a regulation as to the length of the tibiæ in a given class, unless the seat be raised or lowered according as the child has long legs or short ones. Some children have long legs and short backs, others have the contrary; to set such to work together is a course which will assist in developing short sight, and lead to optical defects in both kinds, because the muscles of one set will be strained whilst the other will have less to do, and as a consequence will lose tone and power.

I had the privilege of presiding at a lecture given by Liebreich at the Social Science Association some years ago, in which he dwelt very forcibly upon the injurious effects of habits in schools upon the sight of the learners, it impressed me very strongly as to the mischiefs which accrue to children from attempting to remedy the evils produced, unless the attempts are made in a scientific manner, and upon a correct basis. The size of the printed matter which is used, the direction from whence the light is obtained, and its incidence upon the paper, the position of the learner, the intensity and nature of the light, and the alternation of light and shade, caused by shadows upon the desk, are all matters of importance in arranging a class in a school-house or class-room, and must always be taken into account if teachers themselves are to be produced with perfect sight.

*(To be continued.)*

# Friedrich Fröbel.

BY HIS PUPIL, HERR HEINRICH HOFFMANN, KINDERGARTNER, ALTONA,
*President of the Fröbel-Verein.*

## II.

So things went on from bad to worse. Fred was the scapegoat, the whipping-boy of the home. Whatever happened in the way of mischief he was always suspected of being its author. His brother Christoph had already entered college, and his occasional visits to his home were days of great joy, for in him Fred was then sure of a just and kindly sympathy. Bright sunshine, however, was yet in store for him. When he was nearly eleven years old (1792), his maternal uncle paid a visit to Oberweissbach. Superintendent Hoffman, of Stadt Ilm, a small town in the principality of Schwarzburg Rudolstadt, was a gentleman of considerable culture, having a very gentle and humane disposition, and possessing a keen insight into men and things. He soon understood the awkward position in which Fred was placed. Contrary to the general opinion, he considered the boy as talented, though peculiar, and was persuaded that with suitable treatment he would become a credit and a source of pride to the family. His offer to take the boy's further education into his own hands was gladly accepted. For four years young Friedrich enjoyed the guidance of this exemplary tutor, and those years proved a life-long blessing. He emerged from his seclusion, and began life in earnest. It was a change indeed! Hitherto he had been governed by a rigid strictness, bordering on severity; in his new position he was ruled by gentleness and kindness. Former distrust was replaced by absolute confidence. In his own home all was compulsion; here was a felt liberty. An almost entire seclusion from lads of his own age was now followed by unrestricted intercourse with some forty boys; and last, not least, he now had freedom to roam about in field, on mountain, and in valley, provided he was punctual in his return home.

In three directions this new life was beneficial: his religious life was most favourably developed not only by the excellent tuition of his uncle, whose life at home, as in the pulpit, was all gentleness, charity, and benevolence, but also by that of his teachers; secondly, his physical vigour, stunted by his former seclusion, was here fully developed; and thirdly, the exemplary home life, the firm, quiet, gentle spirit that pervaded the household, greatly influenced his character. Less satisfactory were the secular school lessons. The three R's were indeed well taught, but the instruction in Latin, geography, and history was very superficial indeed.

In his sixteenth year (1796) he returned to his father's home, after having been confirmed by his uncle. It was now time to devote himself to some calling. His mother strenuously objected to his entering upon college life, inasmuch as two of his brothers had already chosen academical studies, and had drained their father's purse to an alarming degree. It certainly could not be denied that Friedrich manifested an ardent desire for spiritual development, that he entered into philosophical questions with an earnestness seldom found in one so young, and that there was ample reason to expect grand things of him, if he were to turn to scientific pursuits. But, strange

to say, in spite of all this, it was a settled axiom, especially with his mother, that the boy was dull in learning, and, in consequence, his schooling had been unpardonably neglected. On the other hand, he manifested no less a decided turn for practical mechanism; and it was concluded that he might perhaps do just as well at some branch of industry. Father and mother were but too glad to profit by the apparent technical propensities of Master Fred; and it was accordingly decided to apprentice him to some forester, to be instructed in some of the various branches of agriculture. With joyful heart Fred consented. Was it not Nature, his dearest friend on earth, that called him to her feet? Agriculture! Yes, that was the grand temple where he meant to serve as high priest! Not a common labourer, not a mere rearer of cattle or cabbage! No, his genius aspired towards the highest ideal of that venerable pursuit. His ambition was to thoroughly master, not only farming in all its branches, but the management of large estates: surveying, with the cognate science of geometry (his favourite study), architecture, social economy, horticulture, arboriculture—in short, everything pertaining to field and forest. A gentleman of great reputation for surveying and geometry, and a good forester, engaged to instruct him for two years in the management of forests; and about midsummer, 1797, he entered upon his new calling at a place distant two days' journey from his paternal home.

If this step was a mistake, it was but partially so. His master, it is true, was too much engaged in his manifold duties to devote much time to the inquisitive youth, and Master Fred had to depend almost entirely upon his own autodidactic studies, and for these the extensive library of his master—himself a self-made man—offered ample opportunity. If he had to forego, however, the personal care and attention of his principal, there were other influences that made this period of his life of great importance to him. Here he found the best instructress—the purest and wisest—ever ready to open to him her boundless treasures of wisdom and knowledge; his dear old friend Nature had him here in the best of her schools, and he listened with rapture to her lectures on trees, and plants, and stones, and animal life. She taught him to refer all her lessons to man and human life. Well might he say, with special reference to this period of his life: 'Nature was my academy, the wood my lecture-hall, the trees and plants and stones my professors, and the children my tutors; all of these continue still to instruct me, and will do so to the end of my life.'

Nor was this all. The law of opposites, as all who are even but superficially acquainted with Kindergarten work will know, is the very corner-stone of the system. The correctness of this principle is remarkably illustrated by the wonderful way in which Providence superintended his education. Here was Nature, in all her silent grandeur, instructing a human dwarf amidst her own green-leaved giants. What would become of him if he were confined to her care alone? Would he ever learn to understand his fellow-men? And, if he did not, would he ever be able to take his proper place among them? Could he ever have the least influence upon them? And what would all his solitary studies be worth, if he had not? The law of opposites required him to associate with his own kind.

It was the house of the physician in the neighbouring town where other treasures and engagements were reserved for him. The doctor was a kind-hearted and sympathising, as well as highly-cultivated, gentleman. He soon understood Fröbel's peculiar character, and knew how to win his affection. To him the solitary youth confided his innermost secrets, the yearnings of his heart, and his futile endeavours to satisfy them. 'You must study natural philosophy,' was the answer; and his whole soul felt at once released from its doubts and fears: he was decided. The library of his principal contained a valuable collection of mathematical books, which he had studied with much interest, but only one small volume, little more than a general outline, on botany. His fatherly friend gave him a scientific compendium, which made him painfully yearn after an academical education.

The future educationalist was also foreshadowed in a rather peculiar way. For the first time in his life, some time before that eventful conversation, he had attended a theatrical performance, and was quite enchanted with all the wonderful things he had heard and seen. The piece, 'Iffland's Jägers,' went to his very soul; and he then thought that the stage, if properly conducted, had in itself the soundest and most powerful elements of popular education. He imagined that in the stage lay a sure means of ennobling and enriching the minds of the masses; and in the exuberance of his philanthropic feelings, he seriously meditated on joining the theatrical company. This ardent impulse owed its origin to the idea that he would by so doing be enabled to benefit his fellow-men. Of course, on second thoughts, he saw the folly of such a step; no, that was not the portal by which he was to enter the El-dorado of his life. Still, the incident shows how restlessly he searched for the field in which his Heavenly Father was preparing him to labour. All kinds of practical handiwork, private studies in mathematics, map-drawing, languages, surveying, botanical studies in field and forest, philosophical researches, meditations on his own inner and outer man, religious and devotional exercises—these were the subjects on which he was earnestly engaged; and when, in 1799, he returned to his parents, he could easily refute any unjust charges of idleness by producing such a surprising collection of essays and treatises as to elicit, even from his stern father, praise and admiration.

Alas! the merry fresh breeze that had so joyfully swelled the sails of his good ship was over, and a disagreeable calm made him anxiously study the different quarters of the heavens. However, what human plans and speculations fail to achieve kind providence often manages, by what we, in our short-sightedness, call chance or accident. It so happened that Father Fröbel had to send a sum of money to his son Traugott who studied medicine at Jena, and matters being rather urgent, young Fred was commissioned to deliver it in person.

Once there, his old dreams of academical studies seized him. Two months of the session still remained, and his brother pleaded that Fred might employ that time to great advantage. That privilege was granted, and the youth stood overwhelmed with surprise and joy at the unexpected realization of his dearest wishes. His application to study was constant and earnest. Topography, drawing of agricultural plans, and cognate subjects filled up all his time. But that time was only too short, and the return journey with his

brother would have been to him like the funeral of all his happiness had he not been sustained by the firm resolve that, come what may, he would revisit Jena and continue his studies there, more especially that of social science.

His father's acquiescence was easily obtained, but under the condition that he should defray all the expenses himself out of a small legacy left to him by his mother.

To this he readily agreed; and he entered upon regular college life at Jena, at the age of seventeen years and a half, in 1799.

However, his path had not been strewn with roses; and unalloyed happiness, if ever experienced by any human being, did not exist for him: It will be needless to say that his moral conduct was in the noblest degree blameless and exemplary. The boisterous manners and ways for which the German students of those days had a rather unenviable reputation, found no echo in him; neither the fencing-ground nor the places of general resort knew him. He was insatiable in his thirst for knowledge, and yet his life at Jena was not attended with the desired success.

There were two great obstacles that seriously impeded his progress. In the first place, he was insufficiently prepared for university studies: his whole education had been of a very indifferent kind, ill-calculated for the learned professions, and it was only on the strength of a certificate from his father that he had been accepted at all as a matriculated student. The second very serious drawback was the want of a clearsighted and sympathising counsellor; naturally reserved as he was, and painfully conscious of much awkwardness of manners, he cared little to mix in society. And he felt no interests in conversations that consisted in mere gossip. His fellow-students looked upon him as an outsider; not only did his scanty means lower him in their eyes, but also the fact of his not having gone through the regular course of Greek and Latin. So his brother Traugott was almost his only associate. He certainly was received as a member of a small society of natural philosophers, where his knowledge and experience secured him much esteem; but except the conscious stimulus for higher aims, Fröbel himself is unable to record much benefit therefrom. Hence, being entirely thrown upon his own judgment, he studied with avidity an excessive number of subjects. He was altogether without a standard by which to measure his own capacity of storing knowledge. His aim was to get at the top of his calling, and everything, even what was only remotely connected with it, he considered necessary fully to master.

FRIEDRICH FRÖBEL.

So he certainly hoarded a great deal of knowledge, a thousand little bits of everything, each of them highly useful no doubt, but that was all. There was no connection, no bond of union that gave to the incoherent mass anything like unity; and, as this unity, this centralisation of all human things, as of all things in nature, constituted the philosopher's stone which he so eagerly sought, it may easily be conceived that he felt anything but satisfied with the result of his academical career.

A very sad and very bitter experience, in no wise discreditable to himself, unexpectedly terminated his studies at Jena. Scanty enough were the means with which he entered upon college life; yet, by dint of rigid economy, he managed to get through the first year, as he thought, pretty comfortably. If in his poverty he had to calculate the largest number of slices he could make his loaf yield, and if he had to be painfully exact not to exceed his daily allowance (I have it from his own lips that he actually 'chalked' his loaf), what of that? Had he not all his higher wants supplied far beyond his digestive powers? No doubt he would have managed to make both ends meet for the remainder of the college term, but that his brother Traugott, being also short of money, asked him for the loan of what he could spare. Of course Friedrich was but too happy to relieve him, but sore disappointment awaited him, when he himself stood in need of its return. He owed some ninety shillings for boarding, he was hard pressed for it, a pitiful appeal to his father was sternly refused, and so he was sent to prison! Nine weeks full of bitter anguish he had to pass in dreary confinement; and when his father at last consented to pay, it was only under condition that he renounced all claims on his future inheritance! (January, 1801). So there was another shipwreck! With what bitter feelings must he have returned to the place that all but disowned him! Of course he did not stay long. Some relatives near Hildburghausen received him very kindly. On their large estate he earnestly devoted himself to practical farming; but here it was that the rather alarming truth that practical agriculture was not his proper calling after all first dawned upon him. Besides, his mind was sorely troubled by the painful misunderstanding between him and his father. We cannot help quoting here Fröbel's own words: 'I could not but esteem and revere him; at his great age he was still so vigorous in body and in mind, irresistible in word and counsel, powerful in execution and action, earnest, even stern in his peroration, firm, even relentless, in his design, but at the same time full of noble, self-sacrificing aspirations. He never shrank from strife and combat to give life to what he had recognised as to be the better plan; he wielded the pen for truth and morality, as the soldier does his sword in the battle. I knew my father to be aged, and near the grave, and it pained me to the quick to find myself misunderstood by such a father. I dearly loved him, and felt how much good that love did me.'

He thought of writing to his father, revealing to him his whole soul, and trying to find a way to his heart; but before he could realise that idea a letter from his father called him home to assist him in writing and other duties, his health being seriously impaired. Fred entered into the many labours and duties with so much heart and soul, nursed his suffering parent with so much tender devotion that he soon made himself indispensable. Now it was that the veil which had so long dimmed his father's sight was withdrawn. He saw his son as he really was; and learning to understand, to esteem, and to love him, a bond of deep and lasting affection united for all eternity two hearts which ought never to have been estranged from each other.

*(To be continued.)*

# Physiology.

BY ARTHUR NEWSHOLME, M.D. LOND.,

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## CHAPTER IV.—THE SKELETON—(*continued*).

The lower limb or leg is composed of a number of bones, which are closely analogous to those of the arm. The scapula is represented by the innominate bone, while the clavicle has no bony equivalent, but only a band of fibrous tissue, called Poupart's ligament, situated at the bend of the groin. The humerus has its counterpart in the femur; while the ulna and radius are represented by the tibia and fibula respectively. Seven tarsal bones take the place of eight carpal bones, metatarsal bones of metacarpal; and phalanges are equal in number in hands and feet.

The bones of the leg are much stronger than those of the arm, and evidently adapted for the erect posture of man. They serve to support the whole weight of the body, and are arranged with this object so as to combine the least weight with the greatest strength and elasticity.

The hip bone, also known as the *os innominatum* or unnamed bone, of each side articulates with the sacrum behind, and with its fellow in front; thus enclosing a basin-shaped cavity known as the pelvis.

Fig. 19.—Pelvis.

Each os innominatum in the young child is composed of three parts—the upper expanded part forming the *ilium*, the posterior part (on which we sit), the *ischium*, and the anterior part, the *pubes*. In the adult these three parts, which were previously connected by cartilage, become fused into one bone, and at their point of junction a bony socket is formed, called the *cotyloid* cavity, corresponding to the glenoid cavity on the scapula, but larger and deeper. The head of the femur fits into the cotyloid cavity so accurately, that if in the dead body all muscles and ligaments are removed from around the joint, the two bones do not separate, the atmospheric pressure being more than sufficient to keep them in position. Owing to this close apposition of the hip and thigh bones, movements at the hip-joint are not so free as at the shoulder; mobility which is not required to the same extent as in the arm, being sacrificed to some extent to security and strength, though present in quite sufficient amount for all required wants.

The *femur* is the largest and strongest bone in the body. It articulates with the os innominatum by

means of a rounded head, which is connected to the main shaft of the bone by a constricted part called the neck. The neck and head are obliquely attached to

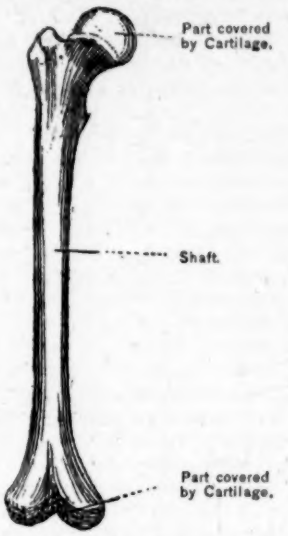


Fig. 20.—Right Human Femur.

the shaft, but in old people they are at right angles to it, and so the danger of fracture of the bone is greatly increased, as well as by the increased brittleness of bone in old age.

The expanded lower end of the femur articulates with the *tibia* or shin-bone, which is a thick pyramidal bone, larger above than below. The *fibula* or splint-bone is attached to the outer side of the tibia at its upper and lower ends, and serves to strengthen it. The front of the knee-joint is strengthened by a small flat bone, known as the *patella* or knee-cap. This may be regarded as a sesamoid bone, that is,

Fig. 21.—The Left Tibia, Fibula, Patella, and Bones of Foot.

a bone developed in connection with a tendon, and it is the largest of such bones. Smaller ones occur in connection with the tendons of the great toe, and a few other places.

The lower ends of the tibia and fibula articulate with the uppermost bone of the tarsus, called the *astragalus*, and flexion and extension of the foot, as in walking, are performed at this joint. The astragalus rests on the *os calcis* or heel-bone, and the whole weight of the body is therefore borne by this bone. The os calcis and the astragalus join in front with the *cuboid*, the *scaphoid*, and the three *cuneiform* bones; while in front of these are attached the metatarsal bones and the phalanges, as in the hand.

Fig. 22.—Bones of Left Foot.

The tarsal and metatarsal bones form a beautiful arch, known as the instep, and this arched shape greatly increases the elasticity of our movements. The arch is maintained by the presence of very strong ligaments on the under surface of the foot. When these ligaments become relaxed from any cause, the arch is destroyed, and *flat-foot* results.

The movements of the phalanges of the foot are not so free as in the hand, but might be much freer were it not for the cramping and deforming results of ill-fitting boots, often begun in childhood.

A study of the anatomical foot will show the proper and desirable boot to wear. It ought to allow free movements of the toes; and as in a normal foot the inner side of the great toe is in a line with the inner border of the rest of the foot, the inner side of the boot should be quite straight. Square-toed boots are therefore always better than round or pointed ones. The sole should be broad, so as to give firm support and not cramp the foot. The heel should not be raised above the level of the rest of the foot, or otherwise the toes are thrown forwards and squeezed in front, and the movements of the foot lose their spring.

The heel of the boot ought always to be long and extend well back. Commonly the heel of the boot and of the foot do not correspond, and this is a common cause of discomfort and of loss of elasticity in moving the foot.

The various bones of the skeleton are continuous with each other by means of joints or *articulations*, and we have different varieties of joints, according to the arrangement of the contiguous bones.

The two main kinds are Movable and Immovable.

In the skull the chief immovable joints occur. The different bones of the skull fit together by means of overlapping or saw-like edges forming what are known as *sutures*.

Movable joints may be divided into Incomplete and Complete. Incomplete movable joints are those in which the movement allowed is very limited. Thus the bones of the vertebræ are connected by discs of fibro-cartilaginous material, only allowing slight movement.

Complete joints allow free movement. There are several kinds. Thus in some cases only a gliding movement is allowed, as in the carpal and tarsal joints. In other cases movement is allowed in all directions; these are called ball and socket joints, and we have common examples in the hip and shoulder joints, the movement in the latter being much freer than in the former. In other cases movement is limited to two directions, either in a rotatory manner from side to side, as in the articulation between the atlas and axis, or backwards and forwards, as in the elbow and knee.

The various kinds of joints may be classified thus:—

1. Immovable articulations.
2. Movable
   - 1. Incomplete articulations.
   - 2. Complete
     - 1. Gliding articulations.
     - 2. Ball and socket
     - 3. Hinge
       - 1. Rotatory.
       - 2. Vertical.

The usual constitution of a joint, except in the fixed forms, is this. Two bones at their junction with each other are covered by smooth glistening cartilage. The part thus covered with cartilage is known as the *articular surface* of a bone. Outside this the two bones are fastened together by *ligaments*, reaching from one bone to the other, and surrounding the joint. The ligaments are composed of dense white fibrous tissue, and are very strong and inelastic. Between the ligaments and the bones is a delicate membrane, which is attached to the edge of the articular surface of bone and then along the inner side of the ligaments of the joint. It is identical in structure with a serous membrane, but has received the special name of *synovial membrane*, owing to its secreting a glairy fluid like white of egg, which is known as synovia. The object of this secretion, which is usually very small in amount, is to prevent friction in the movements of the joint. You will note especially that the synovial membrane does not extend between the two bones, but only surrounds them.

All the structures in connection with a joint may be well examined in a leg of mutton, where the knee-joint can be seen, or by dissecting down to the hip or knee-joint of a rabbit.

*(To be continued.)*

## Lessons in English.

BY ALEXANDER BAIN, LL.D.,

*Author of "Education as a Science."*

### XII.—Emotional Qualities of Style.

Many lessons are wanted to bring out the successes and the failures in touching the springs of emotion by impassioned language. Our pleasurable feelings are aroused by various agencies, as actually occurring; by love, by natural grandeur, by shows, by music, and so on. The representative force of language is brought to bear in producing the effects without the causes in the actual. The previous lessons have already supplied examples in point. We shall take for our present lesson the power of Music, in connection with the grand Odes of Dryden and Pope.

The ostensive purpose of these odes is to recall and body forth the special emotional thrill that musical strains inspire in minds susceptible to the influence. How far they succeed in their design may be best gathered by a close examination.

If the intention were to re-possess our minds of the literal pleasure of a piece of music, without a repetition of the original performance, the obvious mode would be to use those arts that assist the memory in recalling the pleasurable feelings of the past. We have the power of remembering at will any musical strains that we have listened to. The recollection, to be complete, should restore the full force of the original sensations; this, however, is scarcely ever possible. We may approximate to it, more or less, through the presence of closely and firmly associated circumstances, coupled with a good natural memory for music.

The poets in question do not proceed in such a fashion. Neither the end nor the means of poetry correspond with the literal resuscitation of any one's experiences of music. The poet does not save us the attendance at a fresh musical entertainment by giving us back the pleasures of former ones. He makes up an entirely new product, of which music is the pretext and the central subject, but not the filling up.

The musical celebration of St. Cecilia's day gave birth to three of the finest odes in our language—two by Dryden and one by Pope. Dryden's second Ode, known as "Alexander's Feast," eclipsed the fame of his first, but does not render that one less suited for a lesson in the arts of awakening emotion by means of language.

The opening stanza, said by Sir Walter Scott to be the best in the poem, will detain us for a little time. It stands in some degree alone, and the ode would have sufficient unity and completeness without it.

> From harmony, from heavenly harmony,
> This universal frame began
> When Nature underneath a heap
> Of jarring atoms lay,
> And could not heave her head,
> The tuneful voice was heard from high,
> "Arise, ye more than dead."
> Then cold, and hot, and moist, and dry,
> In order to their stations leap
> And Music's power obey.
> From harmony, from heavenly harmony,
> This universal frame began;
> From harmony to harmony
> Through all the compass of the notes it ran,
> The diapason closing full in man.

The high-sounding metre deserves all praise. This is one of Dryden's admitted distinctions as a poet. Nevertheless, metre is not enough. We must add that the words chosen have all, more or less, a flavour of emotion; and that there is no obvious want of keeping, except what arises from the necessity of supplying a contrast, to carry out more effectually the purpose of the poet, namely, to extol the power of music, and to make us feel that power.

Some account has to be taken of the imagery intended to aid in the effect. This is chosen from the greatest of all conceivable subjects—the creation of the world; a theme that, under a poet's hand, ought to yield the very highest sublimity. Nothing but a gross

miscarriage in expression, or else the parroting of the merest commonplace, could make the theme fall flat. We have already credited the author of the Ode with metrical grandeur and with emotion-touched language. But when we examine his imagery for Creation, we find it a very jumbled mixture of the ideas of the old Greek philosophies, without the coherence that even poetry requires. There is a misapprehension on his part in representing any of the old theories as based on musical harmony. The nearest approach to it is the doctrine of Pythagoras, whose fundamental conception of the cosmos was Number; this he connected with music by the discovery of numerical ratios in the musical concords. As a farther connection, he laid it down that the motions of the spheres were accompanied with musical sounds (a favourite poetical allusion); but he did not make music the sole creative force. Dryden has probably been caught by the double meaning of "harmony," namely, as a musical quality, and as orderly arrangement, being opposed to confusion or chaos. At all events, as regards the two first lines, he has made the mistake of referring, without any authority, the origin of the world to music. It is almost needless to criticise the phraseology farther: "heavenly" harmony is made to operate in creating heaven, which is itself but a part of the universal frame of things. The five lines following need a more particular examination.

> When Nature underneath a heap
> Of jarring atoms lay,—

is a figure utterly wanting in consistency of meaning, and justifiable only, provided it can lend itself to poetry. The "jarring atoms" must be intended to give scope to the power of all-creating harmony. "Nature" in this connection has the same self-contradiction as the "heavenly" harmony: the jarring atoms cannot be separated from the totality of things usually expressed by the word.

> And could not heave her head,—

is a feeble iteration of the idea of the two previous lines.

> The tuneful voice was heard from high,
> Arise, ye more than dead.

There is something besides music invoked here; there is an articulate voice of command, to which music lends aid or emphasis. This, however, is to depart from the main idea, the power of music by itself. The command, thus tunefully given, "Arise, ye more than dead," is not apposite to the situation. The jarring atoms have to be brought into better arrangement, and Nature rescued from their weight upon her head. The word "arise" scarcely applies at all; while "more than dead" is unsuitable alike to the jarring atoms and to Nature.

> Then cold, and hot, and moist, and dry,
> In order to their stations leap,
> And Music's power obey.

This is a scrap from another theory of the cosmos —that of Anaxagoras—in which Music has no particular place. That circumstance would not signify provided the thought were poetically rendered and sustained. But, "In order to their stations leap" is not a powerful or an exciting phrase; and the concluding line is superfluous, after the fact is so decisively affirmed. Nor can we forget at once that "Music" is not now the sole power at work.

The closing lines of the stanza repeat the commencement, with a new turn so as to represent Creation in its successive stages.

> From harmony to harmony,
> Through all the compass of the notes it ran,
> The diapason closing full in man.

There is here a change in the working out of the figure. The harmony, instead of being a power outside, is now embodied in the creative process; and, as the products advance in dignity, the musical harmony becomes richer: the climax being the creation of man. Although it is always agreeable to mankind to be flattered, and although the flattery has a poetic figure to express it—the diapason of musical sound—yet a doubt may arise whether the imagery as a whole comes home to our feelings. The work of creation marching to music is not an idea that strongly interests us; the phenomenon itself is so great as to dispense with such an addition, if it be not an encumbrance.

To deal with the subject of Creation in any way is a hazardous undertaking. The very grandeur of the theme makes the difficulty. Its capabilities, indeed, mount to the loftiest sublime, yet the effect is seldom realised. The introduction of music as a creative agency cannot, in the present instance, be pronounced a success. It is neither founded in fact, nor agreeable to our imagination. There are some thoughts that would give us pleasure, provided they are true; there are some that would please us provided they are even probable; there are others that possess a charm, though neither true nor probable. To get at the actual stages of the world's progress from its beginning, would be interesting in the highest degree; to arrive even at a probable hypothesis would be a great satisfaction. If we can attain to neither the one nor the other, and are to exercise our imagination simply, we must follow the laws of imaginative or emotional effect; we must be furnished with a conception thoroughly congenial to some habitual strain of feeling. Now there is at least one expression of creative agency that attains the utmost pitch of sublimity as a stroke of imagination, namely, "God said, Let there be light, and there was light." This may cease to be regarded as a literal fact, but it will never lose its effect on the human mind. We saw that Dryden slipped out of his musical cause, and took in the voice of command; and his instinct was right. A lofty personality exercising vast sway by a commanding word, is one of the situations that affects us with the emotion of the sublime at its utmost stretch. Creative force is necessarily the highest exercise of might; but the analogy of the workshop carried out by production in detail, is not its most effective representation. Still less effective is Dryden's Music as the primeval force, inasmuch as we are entirely unaccustomed to regard music in this particular character.

The second stanza introduces the most famous historical and mythological examples of the power of music:—

> What passion cannot music raise and quell?
> When Jubal struck the chorded shell,
> His listening brethren stood around,
> And, wondering, on their faces fell
> To worship that celestial sound:
> Less than a god they thought there could not dwell
> Within the hollow of that shell,
> That spoke so sweetly, and so well:
> What passion cannot music raise and quell?

This is the best course to pursue. Music is fully recognised by us as a power over the human emotions; and we are prepared for the poet's illustrations of the fact. The first instance is Jubal, the inventor of the earliest musical instrument. The effect upon his listeners is described as made up of astonishment and the inspiration to worship. The case is rather overdone. We are not so transported with the splendour of the thought as to be unmindful of the necessarily humble character of Jubal's original shell. We cannot help being conscious of straining and exaggeration, which means a miscarriage of the attempt at sublimity.

The refrain—

> What passion cannot music raise and quell?

is weak, in consequence of being repeated at the end of such an ineffective stanza; it would have told better in introducing the stanza following:—

> The trumpet's loud clangour
> Excites us to arms,
> With shrill notes of anger
> And mental alarms.
> The double, double, double beat
> Of the thundering drum,
> Cries, hark! the foes come:
> Charge, charge, 'tis too late to retreat.

Making every allowance for the force of the metre, which is great, and for the excitement of the subject—war, we cannot regard the instance as setting forth music in its own proper character. Fighting is the most express outcome of our malevolent emotion; it touches a chord that hardly ever fails to respond. The trumpet and the drum are stimulating in their association with war; apart from that they are nothing, and may be an offence to the ear. A highly trained band on the battle-field may add to the stimulus, and help to charm away the sense of danger; but bravery in fight has never relied upon such an artificial and costly adjunct.

The poet now passes from war to love.

> The soft, complaining flute
> In dying notes discovers
> The woes of hopeless lovers,
> Whose dirge is whisper'd by the warbling lute.

This is altogether feeble and confused. There is an awkward duplication of the flute and the lute; while the descriptive terms scarcely suit either. The flute may be soft, but it is not distinguished by dying notes, or by that degree of power that would soothe the hopeless lover. Not much more relevant is the succeeding stanza.

> Sharp violins proclaim
> Their jealous pangs, and desperation,
> Fury, frantic indignation,
> Depth of pains and height of passion,
> For the fair, disdainful dame.

It is not the instrument, but the tune and the execution, that have the effects supposed. Besides which, the poet incurs the very frequent fault of setting forth the evil much more powerfully than the remedy. Merely to *proclaim* the violence of love-passion is not to add to the credit of music. The string of energetic words made use of on the occasion scarcely preserves distinctness of meaning; and without this, strong terms become an inarticulate jargon. We have the tautology of "pangs" and "pains," "fury" and "indignation" given as if they were different.

> But oh! what art can teach,
> What human voice can reach
> The sacred organ's praise?
> Notes inspiring holy love
> Notes that wing their heavenly ways
> To mend the choirs above.

The objections to the previous stanzas do not apply here. The organ has a character and capability as an instrument, irrespective of the handling. The two first lines are feeble and confusing. The first question, "What art can teach," the organ's praise, is devoid of relevance. The second, "What human voice can reach," is infelicitous, from suggesting the unintended meaning of rivalry with the organ, to which the wording would be more appropriate. "What human *tongue*" might escape the ambiguity.

The three last lines are the poet's expression of the powers of the organ. The phrase "holy love" is both suggestive of tender feeling and appropriate, although not strikingly either the one or the other. The concluding expression is more venturesome and elevated, but does not escape the peril of exaggeration. The obviousness of the picture is hardly redeemed by its taking captive some of our strong emotions. The epithet "heavenly" is always allowable when we have something great to express; but to improve upon heaven is too hazardous.

> Orpheus could lead the savage race;
> And trees uprooted left their place,
> Sequacious of the lyre.

The legends of Orpheus have a permanent value in celebrating the power of music. The present allusion is scarcely full enough or pointed enough. We can tolerate the first line, but the allusion to trees is unsatisfactory: it is a detached item of the following of Orpheus, which, in its nakedness, rather deters us. In the original legend it falls into a group of instances of his power, which, as it were, keep one another in countenance.* The effective employment of Orpheus we may see in Pope's Ode, namely, his all but successful rescue of his Eurydice from the shades. Next to this incident in power, is the part he bore among the Argonautic heroes.

> But bright Cecilia raised the wonder higher;
> When to her organ vocal breath was given,
> An angel heard, and straight appeared,
> Mistaking earth for heaven.

The legend of St. Cecilia is a Christian equivalent of Orpheus, and made her the patron saint of music. Her power, however, did not lie solely in her music, but also in her pure and holy life. Intercourse with an angel, instead of her husband, is assigned to her by the tradition. The "mistaking earth for heaven" is a conceit of doubtful emotional value.

Now comes the ambitious climax:—

> As from the power of sacred lays
> The spheres began to move,
> And sung the great Creator's praise
> To all the blessed above.

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* The following is from the *Argonautica* of *Apollonius Rhodius*, where Orpheus bears a distinguished part:—

> The many stones his magic song obey'd;
> The torrents in their headlong fall were stay'd
> Pieria's beeches heard the measures flow,
> And left their mountains for the vale below:
> There, listening captives of his tuneful hand,
> In order ranged the green memorials stand.
> *Apollonius, Argonautus*, Book I.

This half of the stanza may be viewed by itself. The poet began with Creation, and returns to it in preparing for the close. Once more, however, he shifts his point of view. In the opening, he gave us snatches of early Greek philosophy; he now repeats one of his former ideas, with a Christian addition, and so contradicts himself. Music (as sacred lays, implying words) made the spheres to move, being thus itself the primeval cause of the world; it then drops into the more humble but natural vocation of singing the Creator's praise to the heavenly host. It would need much more grandeur in the expression to surmount such a jumble of incoherent ideas. The "singing of the Creator's praise" is necessarily a lofty allusion, but familiarity detracts from its influence, and it needs to be well set in a fitting situation, in order to re-assert itself.

So when the last and dreadful hour
This crumbling pageant shall devour,
The trumpet shall be heard on high,
The dead shall live, the living die,
And music shall untune the sky.

Grand as these lines are, they have the vice of incoherence. The subject is, in point of lofty sublimity, next to Creation; while it comes home still more impressively to our feelings. The expression in the second line is a powerful stroke of imagery, which criticism gladly commends. The sounding of the trumpet naturally inspires awe; but the remark made on a previous stanza is again applicable; it is not the music that makes the power. The trumpet is the instrument chosen to announce the hour of judgment, and to herald the Creator's miraculous *fiat* in bringing the dead to life.

The fourth line fails to express its meaning; the living are not to die, but to pass through a change, assimilating them to restored dead. The last line is also obscure or insufficient. It possibly means that music will introduce the new life of the blest after the resurrection. But the poet might have put this in a more pointed way, and have appealed directly to the musical employment of the heavenly host.

Ten years after the composition of this Ode, Dryden produced for the same Festival his "Alexander's Feast," whose magnificence of language, and metrical flow have raised it to the distinction of being one of the finest odes in our literature. We are not to examine its merits in detail; we may, however, consider how far it illustrates its theme—the power of music.

The poet creates the imposing situation of a feast given by Alexander to his officers; while, by his side, sits the beautiful Thais; and the singer-bard, Timotheus, performs a succession of inspiring airs. The first stanza is introductory; the second brings in Timotheus:—

Timotheus, placed on high,
Amid the tuneful quire,
With flying fingers touched the lyre:
The trembling notes ascend the sky,
And heavenly joys inspire.

These two last lines express the effect of the music by itself; and they do not amount to much. "The trembling notes" is a suitable, but not very striking phrase; while "*heavenly* joys" is too readily resorted to, being applied to any intense pleasure, and not specially confined to music. The influence of the bard is, for the remainder of the poem, attributed more to the subjects of his song than to the melody. The theme in this stanza is given in the line succeeding the above—"The song began from Jove," whose adventures in love and in sovereignty are tersely set forth; together with the effect of the recital on the listening crowd, and on the monarch himself. The third stanza is the praise of Bacchus; and its power resides in the sentiment more than in the music. The fourth begins with the dangerous elation of Alexander, which Timotheus soon checks by passing to a mournful theme—the fate of Darius, which is touchingly detailed, and draws tears from the eyes of the conqueror. The fifth stanza guides Alexander's course to the love embrace of Thais:—

Softly sweet, in Lydian measures,
Soon he soothed his soul to pleasures.

From this effeminate indulgence the poet wakens him up once more, with a stirring summons to Revenge:—

Now stroke the golden lyre again;
A louder yet, and yet a louder strain;

until the king is made to seize a flambeau and rush off, led by Thais, upon an imaginary foe. This is the last of Alexander; and the energy of the piece is really not the music but the musically-expressed oratory of the inspired bard. The last stanza is the comparison of Timotheus with St. Cecilia, and ends—

Let old Timotheus yield the prize,
Or both divide the crown;
He raised a mortal to the skies,
She drew an angel down.

The stanza, as a whole, is not highly effective. Cecilia is praised for her operative skill in enlarging the bounds of music, adding "length to solemn sounds," working by "Nature's mother-wit, and arts unknown before": very high compliment, no doubt, but cold and intellectual; it inspires no emotion in the reader, and does not contribute to the main theme.

Nothing is so valuable in literary studies as to compare the handling of the same theme by different masters. We have here the advantage of turning at once from Dryden's Ode to Pope's, written for the same festival. Critics are divided as to the relative merits, and may remain so. Perhaps the comparison will give meaning to some of the expressions of Johnson in his celebrated contrast of the two great poets. "The dilatory caution of Pope enabled him to condense his sentiments, to multiply his images, and to accumulate all that study might produce, or chance might supply. If the flights of Dryden, therefore, are higher, Pope continues longer on the wing. If of Dryden's fire the blaze is brighter, of Pope the heat is more regular and constant." This may be partly, but not wholly, true of the two St. Cecilia Odes, which are specially well fitted for testing the point. The first thing to remark in Pope is, that he addresses himself at once to the real subject, namely, to depict the power of the musical art, in itself, and without the accessories of poetry. This he does, in the two first stanzas, by means of general language, and without the aid of illustrative incidents.

Certainly for a man that was so little sensitive to music as he gave himself out to be, the first stanza is a noble outburst, and a fine example of the imaginative power that can work without a basis of personal experience. No doubt a man that united Pope's genius with musical sensibility might have produced something still finer; but I am not aware of an example in point. The result only shows that mere musical sound cannot be so described as to stimulate our emotions to the highest pitch. A few lines from the first stanza will illustrate our meaning:—

> In a sadly-pleasing strain
> Let the warbling lute complain;
> Let the loud trumpet sound,
> Till the roofs all around
> The shrill echoes rebound.

To make so much of the trumpet is confirmatory of the poet's want of the delicacy of the musical sense. The same may be said of the next two lines—

> While in more lengthened tones and slow
> The deep, majestic, solemn organs blow.

The second stanza is a fine expression of the supposed influence of music on the passions, and might have been composed without personal knowledge. It is simply forcible, and plausible, without coming home either to our actual experience, or to our imaginative pleasure.

> By music, minds an equal temper know,
> Nor swell too high, nor sink too low.

This is a very distant approximation to fact. There are more vigorous couplets still, in the stanza; but they have little felicity either as truth, or as feeling.

The third and remaining stanzas take up the story of Orpheus, and depict its phases, as only a great poet could do. Pope is well aware of the vantage ground that this gives him; and he is careful to introduce the efficacy of music at the various critical junctures; while, like Dryden, he avails himself of the art of Orpheus as a poet-musician. He also draws upon the interest of the love-inspired expedition for Eurydice; involving, as that does, the horrors of the Shades.

The concluding stanza resumes and sums up the theme, in a comparison of Orpheus with St. Cecilia; exquisitely composed, but with the hollow ring that characterises the composition as a whole.

The experiment made by two men of the highest genius seems to show that the subject is not suitable to such ambitious treatment. If less were attempted, more might be made of it. The poet's own art, as a whole, whether accompanied by the lyre of old, or as detached from music in later times, is eminently suited to an inspired rendering: and many exquisite specimens have been produced: I may refer to Homer, in the Odyssey, to Shakespeare, to Milton, to Goethe (Wilhelm Meister and Torquato Tasso), and to Tennyson.

*(To be continued.)*

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## The New Class-Subject, 'Elementary Science.'

*(What to teach, and how to teach it.)*

BY RICHARD BALCHIN.

IN this article I propose presenting a syllabus of a year's course of lessons for Standard II.

In the Infants' department of many schools there is a First Standard. This is an undesirable arrangement, though often inevitable. Where such is the case, the First Standard of the boys' department will be very small, and the Second Standard, of necessity, large; and the teacher will probably find it advisable to take the two together for the Elementary Science lessons. If so, the syllabus for the First Standard, as given in the February issue of this magazine, can be taken, and a few of the subjects treated in a more detailed manner than would be the case if the younger children were taught separately.

When I set myself the task of framing a course of lessons in 'Elementary Science' for the six standards of a school, I tried first to form a conception of the subject as a *whole*, regarding it as being, in the main, a means of fostering *mind-growth*. And here I cannot but acknowledge the great assistance I received, and the benefit I derived, from a careful study of Coupland's 'Discipline of the Mind.' For I felt it necessary to know what 'mind' *is*, and *how* it grows, before I was competent to say what would be most likely to best encourage that growth. Well, the conception I formed of science as a whole, as I would teach it to my boys, was that it consisted of 'truths about Nature.'

The next step would be to consider how I should parcel out this great subject among the six standards, so as to secure a logical sequence in the general ideas from the First Standard upwards. Here certain questions forced themselves upon me. What *is* a 'First Standard mind'?' 'What are the particular mental activities I will call into play, and try to develop, in the case of the little children forming this standard?' Not alone from reading works on Psychology, but also from a long experience as an educator, I answer, 'observation.' By 'observation' I do not of course mean simply 'seeing,' but rather the reception of accurate impressions of the material world around us. Well then, having decided upon a principle of action, I proceed to draw up a scheme of lessons for Standard I.; and it will have been seen that the 'observing faculty' is called into play by directing the children's attention to 'the things in the house,' 'the things in the streets,' 'the things in the school,' and 'the things in the fields.'

Having now settled the question so far as the First Standard is concerned, I pass on to consider what shall be the general idea pervading the work to be done in Standard II. What is the next advance in the process of mind-growth? And how shall I make the teaching of 'truths about Nature' available for bringing about and stimulating this advance?

After the mind has grasped the fact that we are surrounded by a multitude of objects, we at once proceed to discover that there is a certain relationship among them: that there are, in the first place, likenesses and dissimilarities. In other words, we begin to *classify*. The School Board for London, in its instructions to teachers concerning this subject of 'Elementary

Science,' very properly places 'the meaning and use of classification' in a very early part of its suggested syllabus. Classification brings into activity 'Judgment,' or the faculty of distinguishing one thing or set of things from others. Hence I would, in Standard II., begin a classification of natural objects. Of course it should be of the simplest kind; for the Second Standard mind is still but an embryo sort of entity.

Then we see, in the second place, that there is a continual interaction going on among all the things around us. All things are mutually and reciprocally affecting or influencing one another; producing that 'change and decay in all around I see.' Some of these interactions may be briefly noticed even in Standard II. Such as (1) the work of the sun; (2) the work of water; (3) the work of the wind; (4) the work of ice; (5) the work of heat, and so on. The influence of vegetables upon animals, of animals upon vegetables; of the land upon the air, and the air upon the land.

From these remarks it will be seen that two main ideas form the ground plan of my scheme for a course of lessons on 'Elementary Science' for Standard II., viz., 'classification' and 'natural operations.' I need scarcely remind the reader that none of the terms I have here used to indicate the line of thought by which I have arrived at these conclusions would be even so much as mentioned to the children: these preliminaries are for myself, not for them.

The following, therefore, is my syllabus for a year's course of lessons in 'Elementary Science' for Standard II. I may remark that some of the titles have already appeared in the course for Standard I.; but the subjects will be treated rather differently.

### PART I.—CLASSIFICATION.

(*a*) General notions of classification: its use and purpose.

(*b*) The three kingdoms of Nature: animal, vegetable, mineral.

(*c*) To name from pictures, etc., the ape, lion, elephant, whale, eagle, crocodile, frog, salmon, oyster, worm: with simple facts.

(*d*) Useful animals. 1. Furnishing food. 2. Furnishing materials for clothing. 3. Doing work.

(*e*) Vegetables. 1. Timber trees. 2. Food vegetation:—(*a*) for man, (*b*) for other animals.

(*f*) Minerals. 1. The stones we use. 2. Clay, mould, sand, and their uses. 3. Coal. 4. Metals:—(*a*) mines and ores, (*b*) iron, copper, lead, tin, alloys.

### PART II.—OPERATIONS OF NATURE.

(*a*) Work of the sun. 1. The sun as the source of light and heat. 2. The work of the sun:—(*a*) filling the air with vapour, (*b*) producing wind, (*c*) producing ocean currents, (*d*) causing the growth of vegetation, ripening fruits and seeds.

(*b*) The work of water. 1. The work of rain, *i.e.*, wearing away land, clearing air, etc. 2. The work of springs, *i.e.*, forming caverns, bringing up materials from the earth, *i.e.*, salt (brine springs). 3. The work of mountain streams, rivers, etc., water-wheels. 4. The work of the ocean, wearing away coasts, forming banks, etc. 5. The work of ice.

(*c*) The work of the wind. 1. Wind-mills, sailing-ships. 2. Carrying things from one place to another, *i.e.*, carrying clouds and sand, wearing away land.

(*d*) Work of heat. 1. Converting solids to liquids, and liquids to gases. 2. Expansion by heat:—(*a*) of solids, (*b*) of liquids, (*c*) of gases.

(*e*) The work of vegetation. 1. The formation of (*a*) starch, (*b*) sugar, (*c*) gluten, (*d*) gum. 2. The supply of pure air, (*a*) to animals breathing in the atmosphere, *i.e.*, land animals, (*b*) to animals breathing in water, *i.e.*, fish, etc.

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As in the First Standard, it is my intention to give the subject-matter of each lesson in the above syllabus, and occasionally to reproduce a lesson actually given.

*(To be continued.)*

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## Notes on Bacon's Essays.

BY FRANCIS WATT, M.A.

### ESSAY XLII.—OF YOUTH AND AGE.

#### SUBSTANCE.

THE advantages and disadvantages of youth and age noticed in detail. We ought, if possible, to employ both in business. Some examples from antiquity are quoted to illustrate these remarks.

*old in hours*, he may have employed as much time profitably as a much older man.

*connivance*, thoughts. Cp. the proverb, 'Second thoughts are best.'

*lively*, active.

*more divinely*, more nobly, as from a higher source.

*heat*, passion.

*perturbations*, disturbances caused by their fierce desires.

the *meridian*, where the sun is at noon, and so in their declining years. Pope talks of the 'Sabbath of my days,' referring to the later years of his life.

*Julius Cæsar*, the great Roman dictator (born B.C. 100, assassinated B.C. 44), was very wild and extravagant in his youth.

*Septimius Severus*, Roman emperor (A.D. 193-211). His victory over the Parthians was commemorated by a great triumphal arch at Rome. He built the well-known 'Roman wall' between the Firths of Clyde and Forth. Spartianus, his biographer, tells us that he lived a youth of errors, or rather of wild excesses.

*reposed*, calm.

*Augustus Cæsar*, first Roman emperor, grand-nephew of Julius Cæsar, and avenger of his assassination.

*Cosmos, Duke of Florence.* Cosmo de Medici, chief magistrate of Florence in 1537. He died 1574.

*Gaston de Foix*, a famous French general, noted for skill and great personal bravery. He fell at the Battle of Ravenna, 1512.

*composition*, disposition, character.

*settled business*, that of which all the rules have been discovered, and have now only to be learned and applied.

*abuseth them*, deceives them: they apply their old methods to new and unsuitable cases. The errors of young men are those of *commission*, of old men, those of *omission*.

*manage*, management.

*embrace*, attempt more than they can manage.

*pursue some few principles*, obstinately or unreasonably act upon certain principles which they have picked up.

*care not to innovate.* It has been noted that this is a somewhat strange character to give to young men. It may mean a certain stubbornness, like that of Rehoboam, Solomon's son (1 Kings xii.).

*which*, the antecedent to the relative is the clause, *will not acknowledge or retract them.*

*unready*, a horse difficult to guide.

*drive business home to the full period*, take full advantage of the chances offered to them.

*period*, stop, end, point beyond which we cannot go.

*to compound employment of both*, to use both.

*extern*, external.

*but for the moral part.* Young men, Bacon thinks, are more likely to have noble thoughts. They will pursue *the right*: old men *the expedient.*

*rabbin*, or rabbi: a Jewish expression, signifying master, used often for the Jewish commentators on the sacred books. As Pope says, 'the rabbins have exprest.' The one here referred to is Isaac Rabrabanel (1437-1508), who commentated on the Old Testament, etc. He held office under Portuguese and Spanish monarchs.

*your young men, etc.* Joel ii. 28, quoted in Acts ii. 17, an ingenious though somewhat far-fetched explanation of the text.

*some have*, observe the omission of relative who.

*brittle wits*, minds not good for much, and which are worn-out and blunted.

*Hermogenes the Rhetorician*, a Greek orator who flourished about A.D. 180. He was remarkably talented when very young, and wrote a treatise on his art; but speedily became imbecile, and died at twenty-five.

*subtle*, acute, refined.

*waxed*, became.

*Tully*, Marcus Tullius Cicero, the great Roman orator of the first century B.C.

*Hortensius*, Quintus Hortensius (B.C. 114-50). 'He was still the same, but did not please as before.'

*strain*, pitch, flight.

*tract of years*, the course of time drags them down to a lower level.

*Ultima primis, etc.* 'His last actions were inferior to his first.' Livy, the Roman historian, gives a more extended character of Scipio Africanus, the conqueror of Hannibal at Zama, in Africa. He took his surname from his exploits in that continent. Livy says that the state of Rome during Scipio's last years did not afford him such a good opportunity for the display of his powers.

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## ESSAY XLIII.—OF BEAUTY.

### SUBSTANCE.

VIRTUE does not require to be accompanied by physical beauty to make it more eminent; and, indeed, men of great physical beauty are rarely celebrated for virtue. Some exceptions noted. Wherein beauty best consists.

*plain*, adv. = plainly.

*comely, though not of delicate feature.* Bacon's ideal is manly, not effeminate beauty.

*rather dignity of presence, than beauty of aspect*, rather general nobility of nature, than mere prettiness of feature.

*almost*, generally.

*excellency*, excellence: so, 2 Cor. iv. 7, 'That the excellency of the power may be of God.'

*great spirit*, high courage and purpose, such as belong to educated natures.

*study rather behaviour than virtue*, are more concerned with external appearance than with real greatness of mind.

*Augustus Cæsar*, see note, Essay XLII.

*Titus Vespasianus*, Roman emperor (A.D. 70-79).

*Philip le Bel*, or the beautiful, King of France (1285-1314).

*Edward the Fourth* ruled in England 1461-1483.

*Alcibiades* (B.C. 450-404). A very handsome, very able, and very dissolute Athenian statesman and general. He was intimate with Socrates, though he was but little improved by the precepts of that sage.

*Ismael* ruled in Persia in the early part of the sixteenth century. *Sophy*, or sufi, or shah, is from Persian *sûfi*, wise. He first added that name to the titles of the Persian rulers.

*favour*, countenance.

*decent and gracious motion*, becoming and noble carriage.

*the first sight of the life*, at first sight we do not feel the full effects of this kind of beauty.

*Apelles*, a very famous painter of antiquity (B.C. 340-323). Alexander the Great thought so highly of him that he is said to have issued an edict forbidding any one but Apelles to paint him.

*Albert Durer*, of Nürnberg (1471). He 'was the greatest of the early German painters and engravers. He enjoyed the friendship of Raphael and Melancthon, and was appointed painter to the Emperor Maximilian I., and afterwards to Charles V.' The work referred to was a treatise 'On the Symmetry of the Parts of the Human Body.'

*are excellent.* Some say that Zeuxis, another famous painter of antiquity, and not Apelles, was the author of this maxim or practice; but, indeed, all painters must to some extent follow the course here reprobated.

*divers*, different, various.

*the more trifler*, the greater trifler; so in 'King John,' II., i., 'To make a *more* requital of your love.

*a kind of felicity*, the divine instinct of genius.

*shall see.* Will see, would be our present form. Will in the third person merely foretells. In this case we should, however, rather make it present, and say, 'A man often sees.'

*never a good*, not one faultless feature.

*in years*, elderly in age. Cp., 'Well stricken in years.'

*amiable*, pleasing. Sir T. Browne talks of 'amiable flowers,' but we now apply the word only to persons.

*pulchrorum autumnus*, 'the autumn of the beautiful is beautiful.'

*by pardon*, by favour, by making allowance for his immature time of life.

*countenance*, confidence of mien, aspect of assurance *Out of countenance* is to want this, so Sir P. Sidney, 'The gentlewoman, even out of countenance before she began her speech.'

*if it light well*, if it happens to be joined to a virtuous disposition. Light is subjunctive. Note throughout these Essays the regular use of the subjunctive mood to express doubt, probability, or condition. At present, we have almost discarded the subjunctive, and in the great majority of the cases where Bacon employs it we could use (following the example of the best modern writers) the indicative. To employ the subjunctive as Bacon does would now give our sentences a pedantic and antiquated aspect.

*virtues shine and vices blush*, it encourages virtue and discourages vice in himself.

*(To be continued.)*

—o—

## Science Notes.

PLAGUE OF LOCUSTS IN RUSSIA.—The inhabitants of various Russian provinces are thrown into dismay by the appearance in enormous numbers of these destructive insects. In the district of Charkoff they are swarming over and destroying the crops of a fertile tract of 50,000 acres. The same frightful disaster has also befallen the people of the district of Novokopersch, in the government of Voroneschki, while almost as bad a visitation has come to the neighbourhood of Taganrog. The most energetic measures are being taken to stamp out the plague, towards which object the district government of Novokopersch have voted twenty-five thousand roubles. In Taganrog the grain and the locusts together have been burnt in order to stamp out the pest. From Borrissoglebsk the latest intelligence is still more lamentable, for the locusts are there ravaging a tract of some seventy thousand acres. Six thousand soldiers sent to the assistance of the inhabitants are powerless to check the appalling destruction committed by these ravaging and insatiable insect-legions. They have also appeared in the government of Balaschevski.

* * * * *

THE TEMPERATURE OF THE THAMES.—Amongst the latest developments of meteorological inquiry, and one which will have an important bearing upon the sanitary state of parts of London, is an arrangement lately carried out by direction of the Corporation of London at the Foreign Cattle Market, Deptford. Under the direction of Mr. G. J. Symons, F.R.S., sets of meteorological instruments have been fixed here for the purpose of ascertaining and recording daily the temperature of the Thames at the surface and at the bottom. Two self-registering thermometers, certified by Messrs. Negretti and Zambra, are secured in case and shafts at the edge of one of the docks, giving a minimum of ten feet of water. They are so arranged that one instrument floats within two feet of the surface, while the other barely touches the bottom. The observations secured by these means are in succession to a series obtained prior to 1870, from the *Dreadnought*, and since then from other sources. It appears from this series of observations that in thirty-three years the highest monthly mean river temperature was 65·7° in July, and the lowest 39·4° in January. The highest reading was given in June, 1846, when it was 73·1°. It is chiefly as an indication of the approach of a thermometrical reading reaching a point where putrefaction sets in, that the new tests, especially in the vicinity of the enormous abbatoirs from whence London is largely fed, will be practically useful. Instruments are also fixed for recording the temperature of the air, the degree of humidity, and the average rainfall.

* * * * *

EARTHQUAKE IN SOUTH-WEST ENGLAND.—An occurrence which is happily very rare was observed last month at several places in Devonshire and Cornwall. An earthquake has been reported by many inhabitants of different towns and villages in that district. It was especially noticed close to Dartmoor, about five hundred feet above the sea level. The trembling of the earth was there very great, and the accompanying noise very loud. Two shocks were observed, the second following the first after the lapse of about half an hour. The line of progress of the earthquake seemed to be from the north-west towards the south-east.

* * * * *

THE MEETING OF THE BRITISH ASSOCIATION AT MONTREAL.—It is announced that next year, at this, the first meeting which has been held outside the United Kingdom, the presidential chair will be filled by Lord Raleigh, F.R.S., the professor of experimental physics in the University of Cambridge. Lord Raleigh was senior wrangler and first Smith's prizeman in 1865. He was elected to his professorial chair on the death of Professor Clerk-Maxwell.

* * * * *

NEW FLORA OF HAMPSHIRE.—Lovers of English botany will be glad to hear that a new flora of this county has just been published by Mr. F. Townsend, M.A., F.L.S. Great care has been taken to make it a complete record, and Mr. Townsend is to be congratulated on being able to include in it several plants not hitherto found there. *Ranunculus ophioglossifolius* is one of these, and is new to the English flora, never having been found nearer than Jersey. In the Isle of Wight, on the Downs at Freshwater, he has found a variety of *Erythræa capitata*, which is only known to occur at one other place in the world. This, somewhat singularly, is in Sussex. There is great need for the botany of our different counties to be worked out in the way Mr. Townsend has scoured Hampshire. If such work were done, doubtless many treasures would be found, and additional localities recorded for our rarer plants.

* * * * *

VETERINARY SCIENCE.—Though this may be emphatically styled the age of scientific investigation and discovery, not much is often heard of work done on original lines in veterinary science. To encourage original effort in this field the Lieutenant-Governor of Bengal has resolved to offer two prizes, of fifty and twenty pounds respectively, for competition by holders of agricultural scholarships from Bengal who are studying at the Royal Agricultural College, Cirencester.

* * * * *

REMARKABLE APPLICATION OF ELECTRICITY.—The national museum at Washington is one of the best examples in the United States of the practical application

of electricity. In so large a building it was found advisable to take advantage of the best means of communication, and these were afforded by the adoption of the telephone. Such a system of these instruments is arranged, that a person in any room can communicate with any other room in the building. Twenty-six telephones are connected by a local telephone exchange, and this, in turn, is connected with the main telephone office in Washington. The result is that only three messengers are needed in the vast establishment. The next circumstance that strikes a visitor is that the photographic laboratory has been made independent of the sun, the electric light being used instead with great success. Electricity is also made to exercise protecting powers. There are 850 windows and 230 doors in the building. If one of either of these opens, a bell rings, and an electric communicator shows to an attendant at the main office which it is. This admirable arrangement will shortly be applied to every case of specimens in the museum. The same agent is ingeniously made to exercise a kind of supervision of the night watchmen. These functionaries are kept to their posts by hourly releasing an electric current at certain stations. The current pierces a dial and records their visit. The sixteen clocks in the building are likewise run by electric current.

* * * * *

CURIOUS PHENOMENA AT CZERNOWITZ.—The Austrian papers report that a mountain in the neighbourhood of Czernowitz, in the Bukovina, is manifesting singular symptoms of disturbance. The ground around its base, to an extent of over 1,000 fathoms, has opened out in wide and deep chasms. Most of the houses of a village on the spot have fallen down.

* * * * *

RESEARCHES ON RABIES.—Mons. Paul Gibier has recently published some extremely valuable investigations which he has been making for a long time on the subject of canine rabies. Like his eminent countryman, M. Pasteur, he has given considerable attention to the possibility of inoculation being a preventive, but most of his inquiries have been directed to the discovery of the true nature of the disease, and its proper recognition. In his paper he discusses five points: (1) The manner of inoculation; (2) Transmission of rabies through the mother; (3) Presence of foreign substances in the stomach of the dog in connection with the diagnosis of rabies; (4) Attenuation of the virus; (5) The parasites of rabies. He shows that canine virus, like some other kinds, may be attenuated by cold, and he believes it to be highly probable that hydrophobia is due to the presence in the blood of a special parasite, though he has not yet scientifically demonstrated this to be the case.

* * * * *

AFRICAN EXPLORATION.—News has recently been received from Dr. W. Junker, the African explorer, which is the more welcome as nearly a year has elapsed since last he was heard of. He is still in the Nyam-Nyam country. His last intelligence was forwarded on October 16, 1882, from the residence of a chief named Sernio, situated some days' journey south of the Mosio district of our present maps. He intimates now that it will not be long before he returns home. He has spent the last six months in various excursions, during which he has repeatedly crossed the Uëlle river to the south. One of these excursions will be of great interest to geographers. It was made to the south of the former Munsa district of the Monbottu; about sixty kilometres, or seven days' journey, to the south of this place he reached a large river called the Nepoko, which he identified with Stanley's Arnwimi, which is one of the main northern tributaries of the Congo, in the middle course of the latter. On September 27 of last year, Dr. Junker sent home his companion, Herr Bohndorff, with the collections made to that time. The natural history and ethnographical collections required thirty-two porters to carry them.

* * * * *

NEW ABSOLUTE METHOD OF MEASURING ILLUMINATION.—Mr. Preece, F.R.S., proposed at a recent meeting of the Royal Society a new method of measuring light. The standard of reference is a small surface illuminated to a given intensity, and the mode of comparison is the light given by a small glass lamp, whose state of incandescence is raised or lowered by increasing or diminishing an electric current. The amount of illumination is increased by the amount of current flowing, so that the number of amperes gives the degree of the illumination. The standard surface is that illuminated by a British 'candle' at 12·7 inches distance. In this way, sunlight, moonlight, twilight, fog, and the amount of illumination of any part of a room or building, can be measured without any reference to the source of light or distance from the point lighted.

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## Julius Cæsar.

### ACT I.

Scene III. The same. A Street.

*Thunder and lightning. Enter, from opposite sides,* CASCA, with his sword drawn, and CICERO.

*Cic.* Good even, Casca: brought you Cæsar home?
Why are you breathless? and why stare you so?
*Casca.* Are not you moved, when all the sway of earth
Shakes like a thing unfirm? O Cicero,
I have seen tempests, when the scolding winds
Have rived the knotty oaks, and I have seen
The ambitious ocean swell, and rage, and foam
To be exalted with the threatening clouds;
But never till to-night, never till now,
Did I go through a tempest dropping fire.
Either there is a civil strife in heaven,
Or else the world, too saucy with the gods,
Incenses them to send destruction.
*Cic.* Why, saw you anything more wonderful?
*Casca.* A common slave—you know him well by sight—
Held up his left hand, which did flame and burn
Like twenty torches join'd, and yet his hand,
Not sensible of fire, remain'd unscorch'd.
Besides—I ha' not since put up my sword—
Against the Capitol I met a lion,
Who glared upon me, and went surly by,
Without annoying me; and there were drawn
Upon a heap a hundred ghastly women,

Transformed with their fear, who swore they saw
Men all in fire walk up and down the streets.
And yesterday the bird of night did sit
Even at noon-day upon the market-place,
Hooting and shrieking. When these prodigies
Do so conjointly meet, let not men say,
'These are their reasons; they are natural;'
For I believe they are portentous things
Unto the climate that they point upon.
*Cic.* Indeed, it is a strange-disposèd time:
But men may construe things after their fashion,
Clean from the purpose of the things themselves.
Comes Cæsar to the Capitol to-morrow?
*Casca.* He doth; for he did bid Antonius
Send word to you he would be there to-morrow.
*Cic.* Good night then, Casca: this disturbèd sky
Is not to walk in.
*Casca.* Farewell, Cicero. [*Exit* CICERO.

*Enter* CASSIUS.

*Cas.* Who's there?
*Casca.* A Roman.
*Cas.* Casca, by your voice.
*Casca.* Your ear is good, Cassius; what night is this?
*Cas.* A very pleasing night to honest men.
*Casca.* Who ever knew the heavens menace so?
*Cas.* Those that have known the earth so full of faults.
For my part, I have walk'd about the streets,
Submitting me unto the perilous night,
And thus unbraced, Casca, as you see,
Have bared my bosom to the thunder-stone;
And when the cross blue lightning seem'd to open
The breast of heaven, I did present myself
Even in the aim and very flash of it.
*Casca.* But wherefore did you so much tempt the heavens?
It is the part of men to fear and tremble
When the most mighty gods by tokens send
Such dreadful heralds to astonish us.
*Cas.* You are dull, Casca, and those sparks of life
That should be in a Roman you do want,
Or else you use not. You look pale, and gaze,
And put on fear, and cast yourself in wonder,
To see the strange impatience of the heavens:
But if you would consider the true cause
Why all these fires, why all these gliding ghosts,
Why birds and beasts from quality and kind,
Why old men fool and children calculate,
Why all these things change from their ordinance,
Their natures and preformèd faculties,
To monstrous quality, why, you shall find
That heaven hath infused them with these spirits,
To make them instruments of fear and warning
Unto some monstrous state.
Now could I, Casca, name to thee a man
Most like this dreadful night,
That thunders, lightens, opens graves, and roars
As doth the lion in the Capitol,
A man no mightier than thyself or me
In personal action, yet prodigious grown
And fearful, as these strange eruptions are.
*Casca.* 'Tis Cæsar that you mean; is it not, Cassius?
*Cas.* Let it be who it is: for Romans now
Have thews and limbs like to their ancestors;
But, woe the while! our fathers' minds are dead,
And we are govern'd with our mothers' spirits;
Our yoke and sufferance show us womanish.
*Casca.* Indeed, they say the senators to-morrow
Mean to establish Cæsar as a king;
And he shall wear his crown by sea and land,
In every place, save here in Italy.

*** In order to save space we shall discontinue printing the text of 'Julius Cæsar,' and in future only the Notes will appear.

NOTES ON SCENE III.

1. *Brought.*—Accompanied.

3. *Are not you moved?*—Cicero is from all points of view a man less likely to be moved by the portents of nature than Casca. *Sway.*—The rule of earth. The laws of Nature seem as abolished for a time.

4. *Unfirm.*—Not simply weak, but destitute of firmness.

9. Note the strength of the last three words, with their partial repetition of what has gone before.

12. *Saucy.*—An instance of a word usable in the poetry of Shakespeare's time, but from its associations no longer to be employed in metrical writing. *Find another instance of this in 'Julius Cæsar.'*

14. Than your tempests, riven oaks, and this night's storm-dropping fire?

15. *You know him.*—A Shakespearian graphic touch.

18. *Sensible.*—Capable of feeling. ('Coriolanus' I., iii., 85.)

21. *Surly.*—Probably connected with sour. It may be sir-like. Is it adjective or adverb here?

22, 23. A terrific picture in a few words. One regrets that Gustave Doré never painted it.

26.—*Bird of night.*—The owl.

28. *Prodigies.*—Monstrosities, abnormal things, from arrangement of entrails in a sacrificed beast to a comet.

30. Do not attempt to explain that which Casca for the nonce considers to be supernatural, in terms of the natural.

34, 35. The calmer reason of the philosopher comes in.

36. The scene with Casca, full of his portents, is made to begin and to end with Cæsar, to whose fate all the portents have reference. Note line 1 of this scene as well as this line.

41. The night so dark, the cloaks so closely drawn that only by the voice can familiar friends recognise one the other.

47. *Me.*—Myself.

48. *Unbraced.*—An adjective for Elizabethan dress, not Roman.

49. *Thunderstone.*—Thunderbolt. By many regarded, even in this scientific age, as the same as the belemnites, fossil-stones that are really the bones once within the mantles of ancient cuttle-fishes.

50. *Cross.*—The 'quick cross lightning' of Cordelia's speech in Lear (IV. vii. 39).

51. Enacting the part of Ajax defying the lightning.

54. The lower nature of Casca can only read, in all this, supernatural messages. Cassius brings it all to bear upon the physical facts of their own life in Rome at that hour.

58. *Use.*—Employ. Compare this with the very different use of the word in line 259 of the preceding scene.

60. *Put on.*—Wear. *Cast yourself in*-to fear, as into garments.

64. *Kind.*—Nature. The word 'deviate,' or some equivalent, is understood.

65. *Fool.*—Play the fool. Some read it as 'fools,' making it with 'old men and children,' nominative to the verb 'calculate.' This last has here the sense of weighing all these wonders and speculating as to their meaning.

66. *Ordinance.*—That which is ordained to them. The same idea is contained in the 'preformed' of the next line.

67. *Monstrous.* — 'Monstrum' = anything unusual. The botanists still speak of sports or abnormal variations in plants as 'monsters.'

71. To make them as instruments that may fill men with fear in respect to, and warn them against the dangers in, the abnormal condition of affairs.

75. *The lion.*—Is this the beast that Casca had met and upon it drawn sword (lines 19, 20)? Or is it some habitual animal supposed by the dramatist to have been kept in the Capitol of Rome, as lions were kept in the Tower of London?

76. *Me.*—Badly, as we think to-day, for 'I.'

79. *'Tis Cæsar.*—The dread name is whispered. And it is

not the prime mover that mentions it first. How carefully he feels his way and wrings the name from Casca's own lips.

80. *Let it be who it is.*—Still he will not speak out quite clearly. Nor does he thus until Casca has again named the name of Cæsar.

81. *Thews.*—Muscles. Perhaps connected with 'thigh.'

82. *Woe the while!*—Alack-the-day. Generally used with 'worth' after the woe. This 'worth' is from the German *werden.*

83. *With.*—For 'by.' Vagueness of prepositions.

84. The burden we bear, the patience with which we bear it.

86. Again the name from Casca.

89. He will slay himself. Here we meet for the first time with that which runs through so much of this play, the question of suicide. To Cassius self-slaughter is the perfectly natural solution of the problem of life when it becomes an unbearable riddle. From the slavery to King Cæsar his own hand shall free him.

91, 92. It is the gift of the gods, this power. Compare this idea with the more modern Hamlet's, that 'the Everlasting' has 'fixed His canon 'gainst self-slaughter.' (I., ii., 131.)

92. *Tyrants.*—Accusative to 'defeat.'

93. These lines call to mind the Lovelace verse—

> 'Stone walls do not a prison make,
> Nor iron bars a cage;
> Minds innocent and quiet take
> That for a hermitage.
> If I have freedom in my love,
> And in my soul am free,
> Angels alone that live above
> Enjoy such liberty.'

99. So much of the burden of tyranny as rests on my individual life can be cast off with the taking of that life. Observe the fine introduction of 'Thunders still' at this point, as though the gods approved, or, perhaps, rebuked.

100. Casca holds the same views.

106. *Hinds.*—Strictly feminine. The female deer is thus called, and the name is applied by Marcius to the coward soldiers.

108. *Trash.*—Originally the trimming of a hedge. Hence 'rubbish.' Compare 'Tempest,' I., ii., 81.

109. *Offal.*—For any worthless thing.

112. A feeler put out to try Casca.

117. *Fleering.*—Sneering. The Scotch have 'fleyr,' to make wry faces. *My hand.*—Offering this in pledge of his honesty.

118. *Factious.*—Facio = I make, I do. Form a party, perhaps; be active, certainly.

120. *There's.*—The hand is taken.

122. *Some certain.*—One or the other word is redundant. 'Coriolanus,' II., iii., 59, has the same redundancy.

124. *Honourable-dangerous.*—The first part of this compound word is adverb to the second.

125. *This.*—Time.

126. *Pompey's porch.*—In the Campus Martius stood the temple of Pompey, and in one of its porches was the statue of Cæsar's ancient foe. Here Shakspere feigns that the conspirators met. In reality it was here that the Senate met, and that Cæsar was assassinated. There is a dramatic fitness in their meeting by Pompey's statue, and killing the head of the Roman world in the Capitol, the head building of the city Rome.

127. *Or.*—For nor.

128. *Element.*—Of the four elements, earth, air, fire, water, the only one possible here is air.

129. *Favour.*—Complexion, as in 'well-favoured.'

131. Suspicion is rife. The one in haste may be friend or foe. Stand close, therefore, that we may see.

132. *By his gait.*—Another instance of the keen power of observation of Cassius.

134. The darkness and the doubt begotten of it are suggested by all this.

135. *Incorporate.*—Made part of. In, and corpus = body.

137. *I am glad on't.*—An answer to the former part of Cassius' last speech. The end was lost in the hurly-burly of the storm.

138. *Two or three.*—Besides Casca. The general nature of the portents is brought out here.

140. This and the line following are not heard by Casca.

141. The wish of all.

142. Cinna is made the instrument of Cassius. The ideas on which he brooded at the end of the scene before, he puts in action through an inferior agent. Thus, if the actor in these deeds is discovered, it will not be Cassius.

143. *Prætor.*—The officer for the administration of justice in Rome.

144. *But.*—Only. And then it must be read in front of the word 'Brutus.'

146. *Old Brutus' statue.*—Still harping on his ancestor.

148. *Is.*—Often occurs in Shakspere at the beginning of a sentence with more than one nominative following.

149. *Metellus Cimber.*—See line 134; Metellus is abroad seeking Cassius; the rest are awaiting him. Nothing could be more natural than the enquiry of Cinna in the earlier line when he sees a cloaked man with Cassius.

150. *Hie.*—Higian = to hasten.

152. See line 126.

159. *Alchemy.*—Al = Persian 'the.' The alchemists, fathers of our modern chemists, had as one of their chief aims the transmutation of baser metals into gold.

161. The *crescendo* of these three is excellent.

162. *Conceited.*—Imagined.

164. *Awake him.*—You will find him awake.

## ACT II.—SCENE I.

**Throughout this scene we have a picture of the working of a great mind. With exquisite art that mind is shown throughout in contrast to that of a child. The children of Shakespeare, always delightful, are most delightful in Lucius. He is thorough boy, and few things are more charming or more pathetic than to see him playing on the edge of these conspiracies.**

1. The worn man calls for the sleeping boy as something of a rest to him.

4. What a sigh is here!

7. *My study.*—From the stars to the books, and yet no rest.

10. A soliloquy as perfect in its way as any of the famous Hamlet self-communings. Its first word tells us of the subject of his meditations. The 'it' is Rome's freedom.

12. *General.*—The general good.

14. *Bright day.*—Prosperity.

19. *Remorse.*—Pity.

21. *Proof.*—Experience.

24. *Round.*—Compare 'rung.'

26. *Base degrees.*—Lower steps.

28. *Quarrel.*—Complaint. Latin, *querela.* Fr. *querelle.* From, primarily, the Latin *quare.*

29. *Colour.*—Pretext.

33. *As his kind.*—After his kind, as in the earlier verses of Genesis. See especially the eleventh verse of chapter i., 'the fruit-tree yielding fruit after his kind.'

36. *Searching the window for a flint.*—The flint ought to be in a definite place. But boy Lucius has mislaid it, and has been this while groping in the dark for it.

37. *Paper.*—Cassius and Cinna have been at work. See I., iii., 144.

41. As if dates had yet entered into the boy's calculations!

49. *Often.*—This has been for long a device of Cassius.

54. *Tarquin.*—Tarquinius Superbus, seventh and last of the imaginary kings of Rome, was with all his family and belongings driven from Rome, B.C. 509. Lucius Junius Brutus, the ancestor of the present speaker, was foremost amongst the expellers of the king, and was made, after his expulsion, the first consul.

56. *'I make thee promise.'—Parse this phrase, noting especially the dative 'thee.'*

57. *If the redress will follow.*—He will not strike unless he feel sure that by no other means can redress come. A notable passage as showing the real position of Brutus in this troublous matter. 'Much virtue in "if,"' as Touchstone has it.

59. And the fifteenth, the day now dawning, is the ides of March.

61. *Whet.*—Middle English, 'whetten,' Dutch, 'wetten,' German, 'wetzen' = to sharpen. All of these from the Teutonic base, 'hwat' = to excite.

63–69. A word-picture of that which Shakspere has shown as a life-picture in Macbeth. 'The first motion' there is when the witches meet him on the blasted heath. 'The action' is when Duncan is murdered.

64. *The first motion*—the first prompting. *Interim.*—Between whiles. From *inter* = between, and *im* old accusative of *is*, demonstrative pronoun. The Latin adverb of the same form = meanwhile. The word as a noun occurs at least fourteen times in Shakspere.

65. *Phantasma.*—The literal form of the Greek word for a spectre. φαινω (phaineo) = I appear. It is supposed that here the word means a nightmare. But to my mind the actual meaning of the Greek word is the best here in every sense. At least we have then a contrast between the spectre and the dream-time, instead of a repetition of the same idea.

*(To be continued.)*

# SUMMER GAMES.

Brisk. mf
T. CRAMPTON.
1st TREBLE.
2nd TREBLE.
1. "But-ter-flies wing-ing from rose to rose— What are you playing? There's no one knows."
2. "Sum-mer winds, toss-ing green leaves a-bout— What are you play-ing at when you're out?"
3. "Grass-hop-pers skip-ping o'er mea-dows sweet— What do you play with four nim-ble feet?"
BASS.
KEY A. Brisk. mf
1st TREBLE.
2nd TREBLE.
BASS.
"Lit-tle maid, lit-tle man, oh, 'tis fun, Roam-ing and sport-ing till set of sun!
"Lit-tle maid, lit-tle man, come and see— Here we go ra-cing from tree to tree:
"Lit-tle maid, lit-tle man, one, two, three, Hip-per-ty, hop-per-ty, can't catch me!
E. t.
p
Ro-ses and li-lies, and vio-lets weak, 'Mong these we play at hide and seek;
Oh, it is jol-ly! we nev-er flag— This is our mer-ry game of tag;
Oh, such a mer-ry, de-light-ful game! Hop-scotch you young folks call its name;
f. A. p
f
Hide and seek, 'Mong these we play at hide and seek."
Game of tag, This is our mer-ry game of tag." Symph.
Hop-scotch game, Hop-scotch you young folks call its name."
Hide and seek,
Game of tag,
Hop-scotch game,
Symph.

# TIME

Class 1.=Standards IV., V., VI. Class 2=Standard III. Class 3=Standard II. Class 4=Standard I.

## MORNING.

| Day. | Class. | 8.50 —9. | 9—9.35. | 9.35— 9.50. | 9.50—10.25. | 10.25— 10.35. | 10.55—11.15. |
|---|---|---|---|---|---|---|---|
| Monday. | 1 2 3 4 5 | Prayers. Assemble. | Old Testament. | Registers marked and closed at 9.50. Home Lessons examined. | Arithmetic<br>Reading M.<br>Reading P. T., c.r.<br>Writing M.<br>Arithmetic A., c.r. | Recreation, or Marching and Singing. | Reading M.<br>Transcription M.<br>Geography P. T., c.r.<br>Arithmetic M.<br>{(1) Writing (2) Reading} A., c.r. |
| Tuesday. | 1 2 3 4 5 | | New Testament. | | Arithmetic<br>Reading M.<br>Reading P. T., c.r.<br>Transcription M.<br>Arithmetic A., c.r. | | Reading M. } c.r.<br>Arithmetic M. }<br>Dictation P. T.<br>Arithmetic P. T.<br>{(1) Writing (2) Reading} A., c.r. |
| Wednesday. | 1 2 3 4 5 | | Old Testament, Texts, and Hymns. | | Arithmetic<br>Reading (Geography) M.<br>Reading P. T., c.r.<br>Writing M.<br>Arithmetic A., c.r. | | Reading M.<br>Arithmetic M.<br>Dictation P. T., c.r.<br>Arithmetic P. T.<br>{(1) Writing (2) Reading} A., c.r. |
| Thursday. | 1 2 3 4 5 | | New Testament. | | Dictation P. T.<br>,, P. T.<br>Reading M., c.r.<br>Transcription M.<br>Arithmetic A., c.r. | | Arithmetic P. T.<br>Reading P. T.<br>Reading M., c.r.<br>Arithmetic<br>{(1) Writing (2) Reading} |
| Friday. | 1 2 3 4 5 | | Catechism. | | Arithmetic M.<br>Reading (Geography) M.<br>Reading P. T., c.r.<br>Writing M.<br>Arithmetic A., c.r. | | Reading (Geography) M.<br>Arithmetic M.<br>,, P. T.<br>,, P. T.<br>{(1) Writing (2) Reading} |

Needlework taken by the Girls and all the Infants under the Standards III. or IV. and VII. would be silently preparing their Reading lesson, or Reading under the charge of a Monitor, while the Master examines the school monthly.

This Time Table is drawn up for a school of 120 children, of whom 40 are infants, but none half-timers. There is a main-room and two class-rooms, and the staff consists of a Master, a female Ex. P. T., and a P. T. at the end of his 3rd year. The Assistant takes the infants, and gives instruction to the girls in Needlework. In a school of this size, the Master could take Standards III. and VII. himself, and also supervise the work of I. in Writing or Arithmetic. The work has been arranged so as to give adequate attention to each class in every subject. Now that three reading-books are required in Standard III. and upwards, it is necessary that these classes should have eight Reading lessons a week each, of which two should be from the Geography, and six from the History Readers. Two oral lessons in Geography would be required for Standards II. and VII., and one for Standard I. The girls, when at Needlework, would have one lesson in Grammar, Writing, Arithmetic, and Reading respectively. The infant boys take Needlework, so that they could be worked with the girls. The Assistant takes Standard I. in the last lesson of the afternoon.

# TABLE.

Class 5 = Infants. M. = Master. A. = Assistant-Mistress. P. T. = Pupil-Teacher. c.r. = class-room.

| | | | AFTERNOON. | | | |
|---|---|---|---|---|---|---|
| 11.15—11.55. | 11.55—12. | 1.25—1.45. | 1.45—2.30. | 2.25—3.10. | 3.10—3.50. | 3.50—4 |
| Writing M.<br>,, M.<br>,, M.<br>Reading P. T., c.r.<br>{(1) Reading (2) Writing} | Grace and Dismissal. | Assemble. Grace, Singing, and Tables. Registers closed at 1.40. | Grammar M.<br>,, M.<br>,, P. T., c.r.<br>Transcription M.<br>Needlework c.r. | Reading (History) M.<br>,, M.<br>Arithmetic M.<br>Reading P. T., c.r.<br>{Object Lesson and Singing} | Dictation M.<br>,, M.<br>,, P. T., c.r.<br>Geography A., c.r.<br>{Infants dismissed at 3.10 each day} | Prayers and Dismissal. |
| {Composition and Dictation} M.<br>Dictation M.<br>Arithmetic P. T.<br>Reading P. T., c.r.<br>{(1) Reading (2) Writing} | | | Writing M.<br>,, M.<br>,, M.<br>Reading P. T., c.r.<br>Needlework c.r. | Geography M.<br>Arithmetic M.<br>Reading P. T., c.r.<br>Arithmetic P. T.<br>{Object Lesson and Singing} | Reading (Geogr.) M.<br>Geography M.<br>Poetry P. T., c.r.<br>Dictation A., c.r. | |
| {Composition and Dictation} M.<br>Dictation M.<br>Arithmetic M.<br>Dictation P. T. | | | Arithmetic M.<br>,, M.<br>,, M.<br>Reading P. T.<br>Needlework c.r. | Grammar M.<br>,, M.<br>,, P. T., c.r.<br>Arithmetic M.<br>{Kinder-Garten and Exercise} | Reading (History) M.<br>,, P. T., c.r.<br>Transcription<br>Dictation A., c.r. | |
| Writing P. T.<br>,, P. T.<br>,, P. T.<br>Reading M., c.r.<br>{(1) Reading (2) Writing} | | | Reading M.<br>,, M.<br>,, P. T., c.r.<br>Writing M.<br>Needlework c.r. | Geography M.<br>Arithmetic P. T.<br>Transcription M.<br>4 & 5 {Object Lesson and Singing} | {Composition and Dictation} M.<br>Geography M.<br>Arithmetic P. T.<br>Reading A. | Home Lessons taken down. |
| Singing<br>{(1) Reading (2) Writing} | | | Grammar M.<br>,, M.<br>,, P. T., c.r.<br>Arithmetic<br>Arithmetic A. | Poetry M.<br>,,<br>Dictation P. T.<br>,, P. T.<br>{Kinder-Garten and Exercise} | Drawing<br>,,<br>,, P. T.<br>Poetry A. | |

Assistant-Mistress on the first four days from 1.30 to 2.30.

Master is engaged part of the time at the Arithmetic of Standards IV. and VII., or the Writing or Arithmetic of Standard I. The Singing taught by ear only.

## SUMMARY.

| Subject. | Class 1 | 2 | 3 | 4 | 5 No. of Lessons. |
|---|---|---|---|---|---|
| Religious Knowledge | 5 | 5 | 5 | 5 | 5 |
| Reading | 8 | 8 | 7 | 7 | 5 |
| Writing | 3 | 3 | 3 | 4 | 5 |
| Dictation and Transcription | 5 | 5 | 6 | 7 | — |

| Subject. | Class 1 | 2 | 3 | 4 | 5 No. of Lessons. |
|---|---|---|---|---|---|
| Composition | 3 | — | — | — | — |
| Arithmetic | 6 | 6 | 6 | 8 | 6 |
| Grammar | 3 | 3 | 3 | — | — |
| Geography | 2 | 2 | 2 | 1 | — |
| Needlework | 4 | 4 | 4 | 4 | 4 |

| Subject. | Class 1 | 2 | 3 | 4 | 5 No. of Lessons. |
|---|---|---|---|---|---|
| Singing | 1 | 1 | 1 | 1 | 3 |
| Drawing | 1 | 1 | 1 | — | — |
| Object Lessons and Kinder-Garten | — | — | — | 1 | 5 |

# A Lesson on Drawing a Map on 'Mercator's Projection.'

BY JOSEPH H. COWHAM, F.G.S.,

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## INFORMATION.

### 1. Obvious differences between the World in Hemispheres, and on Mercator's Projection.

#### (*a*) Map in Hemispheres.

(1) The Equator is the only straight line.

(2) All the parallels are curved lines, and are not parallel to one another.

(3) All the meridians are curved lines, and meet at the Poles.

(4) The relative size of countries in different latitudes is preserved.

#### (*b*) Mercator's Map.

(1) The parallels are all straight lines, and are parallel to the Equator and one another.

(2) The meridians are all straight lines, and are parallel to one another. Hence they do not meet at the Poles.

(3) The countries in high latitudes are greatly exaggerated.

### 2. How the Meridians on Mercator's Map are obtained.

Suppose a globe, capable of expanding, placed within a cylinder. The meridians on the globe are to be transferred to the inner surface of the cylinder.

(*a*) Place the cylinder in contact with the globe at the Equator.

(*b*) Expand the globe until its sides press against the inner surface of the cylinder.

(*c*) The **Meridians** would touch the cylinder in a series of straight lines parallel to each other.

(*d*) There would be no expansion of the space between the meridians at the Equator.

## TEACHING NOTES AND ILLUSTRATIONS.

Fig. 1. Meridians and parallels as drawn on a map of one of the hemispheres.

(*a*) The four statements under (*a*) form a revision of the last lesson. (See PRACTICAL TEACHER for June.)

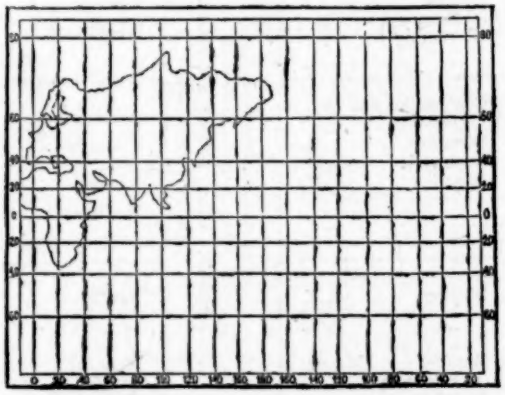


Fig. 2. Meridians and Parallels as drawn on Mercator's map.

This comparison would be aided by the above diagrams. Refer also to an ordinary full map of the world in hemispheres and on Mercator's Projection.

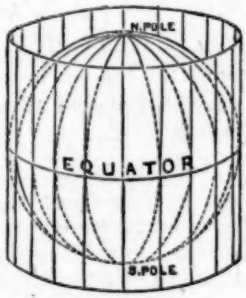



Fig. 3. Globe placed inside a cylinder. The straight lines on the cylinder indicate the position of the meridians when the globe is expanded.

(*c*) As we proceed from the Equator the expansion between the meridians would increase with the distance, *e.g.*—

(1) At 60° N. or S. Lat. the space between the meridians would be drawn out nearly twice their size as represented at the Equator.

(2) At 70° N. or S. Lat. the expansion would be nearly three times the size at the Equator.

The exaggeration in the size of countries at a distance from the Equator in an east and west direction is thus accounted for.

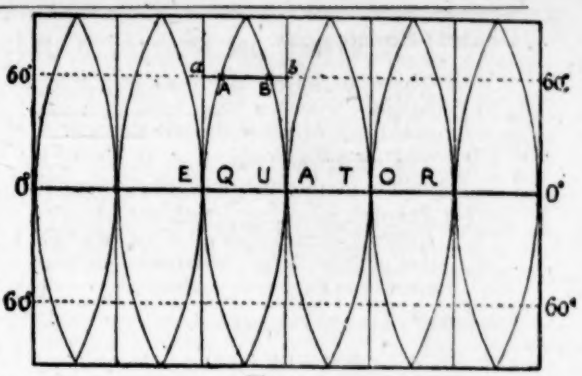



Fig. 4.

(*c*) Illustrated by Fig. 4, and by taking the peel from an orange. Cut the peel into gores, and place these side by side.

Each division might represent the space between two meridians. The gores must evidently be stretched, if they are to occupy the whole space, and the further from the line along which all the gores are in contact, the greater must be the expansion.

In Fig. 4 the space AB must be drawn out to *ab*.

### 3. How the Parallels on Mercator's Map are drawn.

Suppose the cylinder is cut along the meridian AB., and unrolled with that meridian placed in contact with the globe at the Equator.

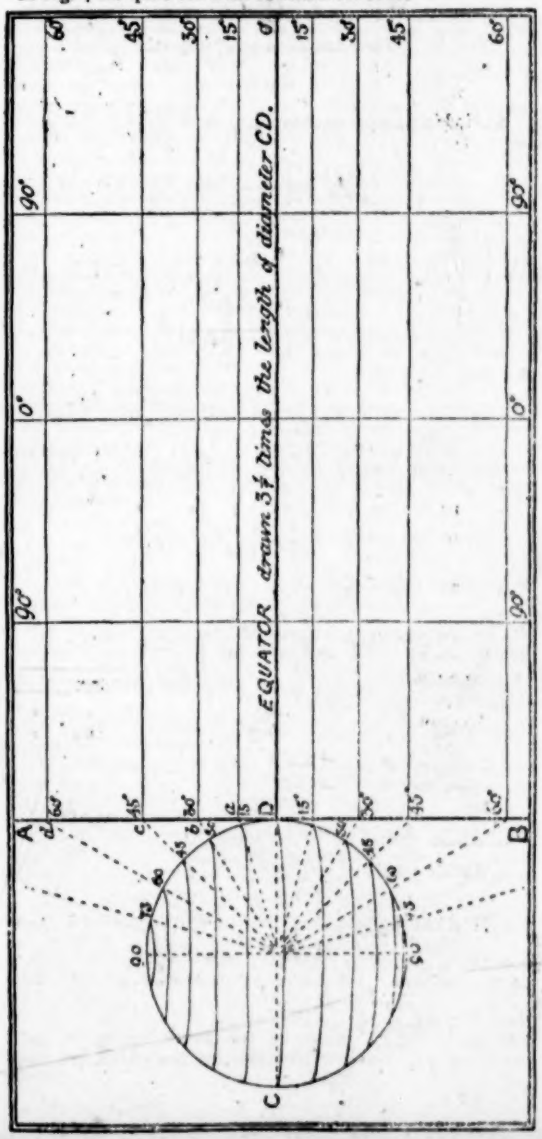
If, now, the dotted lines be drawn from the centre of the globe through the parallels 15°, 30°, 45°, 60°, and 75° N. and S. Lat. to the meridian AB, meeting that meridian in the points *a*, *b*, *c*, *d*, etc., etc., these points will indicate the distance of each parallel from the Equator when the globe is expanded to meet the circumscribing cylinder.

NB. (*a*) The parallels near the Equator are almost the same distance apart on the globe and on the map.

(*b*) The further we move from the Equator, the greater is the distance separating the parallels on the map, although on the globe they are all the same distance apart.

(*c*) The parallels above 80° N. and S. are never drawn on the map.

The exaggeration in the size of countries at a distance from the Equator in a north and south direction is now accounted for.



## General Conclusions.

(1) The countries on Mercator's Map in high latitudes are on a large scale when compared with countries near the Equator.

(2) The enlargement has been shown to be both in the direction of length and breadth.

(3) The right relation of length and breadth is fairly maintained when a limited area—like that of Great Britain, for instance—is taken apart from the rest of the map.

(1) Compare Greenland and Africa. Apparently they are the same in size; but Greenland has under 1,000,000 square miles area, whilst Africa has 12,000,000 square miles.

(2) See statements at the end of paragraphs 2 and 3 in the information column above.

(3) Compare the shape of England on Mercator's Map with its general shape on the map in hemispheres.

# ANSWERS TO
# Pupil Teachers' Examination Papers.

## JUNE 30.

## FIRST YEAR.

### Pupil Teachers at end of First Year.

### Arithmetic.

*Three hours and a half allowed.*

MALES.

1. Find in a simple fraction the value of $\frac{3\frac{1}{3}+\frac{2}{3}\text{ of }1\frac{1}{2}}{4\frac{1}{2}\text{of}2\frac{1}{2}-1\frac{2}{3}} \div \frac{1\frac{2}{3}}{2\frac{1}{2}}$

$$\frac{3\frac{1}{3}+\frac{2}{3}\text{ of }1\frac{1}{2}}{4\frac{1}{2}\text{ of }2\frac{1}{2}-1\frac{2}{3}} \div \frac{1\frac{2}{3}}{2\frac{1}{2}} = \frac{\frac{7}{3}+\frac{3\times7}{4\times6}}{\frac{9\times11}{2\times5}-\frac{11}{3}} \div \frac{\frac{7}{3}}{\frac{5}{2}}$$

$$= \frac{\frac{7}{3}+\frac{7}{8}}{\frac{99}{10}-\frac{11}{3}} \div \frac{14}{15}$$

$$= \frac{\frac{28+7}{8}}{\frac{792-110}{80}} \div \frac{14}{15}$$

$$= \frac{35\times80\times88}{8\times682\times63} = \frac{200}{279} \text{ Ans.}$$

2. A person who owns $\frac{15}{16}$ of a ship, sells $\frac{2}{3}$ of his share and then $\frac{3}{11}$ of the remainder. What fraction of the ship has he left?

1st sale $= \frac{2}{3}$ of $\frac{15}{16} = \frac{30}{128}$;

∴ 1st rem. $= \frac{15}{16} - \frac{30}{128} = \frac{40-15}{128} = \frac{25}{128}$;

2nd sale $= \frac{3}{11}$ of $\frac{25}{128} = \frac{3\times25}{10\times128} = \frac{75}{1280}$;

∴ 2nd rem. $= \frac{25}{128} - \frac{75}{1280} = \frac{50-15}{256} = \frac{35}{256}$. Ans.

3. Multiply ·0625 by ·375, and prove the correctness of the pointing by vulgar fractions.

| | |
|---|---|
| ·0625 | *Proof.* |
| ·375 | ·0625 = $\frac{625}{10000}$ |
| 3125 | ·375 = $\frac{375}{1000}$ |
| 4375 | and $\frac{625}{10000}\times\frac{375}{1000} = \frac{234375}{10000000}$ |
| 1875 | $= ·0234375$ Q.E.D. |
| ·0234375 Ans. | |

4. Divide 5·8566 by 77·4, and 585·66 by ·774.

(a)

77·4)5·8566(·0756 Ans.
5 418
4386
3870
5160
4644
5160
....

(b)

·774)585·66(756·6 Ans.
541 8
43 86
38 70
5 160
4 644
5160
....

5. Express ·428571 of ·375 of a guinea as the decimal of £·875.

·428571 of ·375 gu. = $\frac{3}{7}$ of ·375 gu.

∴ the required dec. $= \frac{\frac{3}{7}\text{ of }·375\text{ gu.}}{£·875}$

$$= \frac{21\text{s.}\times\frac{3}{7}\text{ of }·375}{20\text{s.}\times·875}$$

$$= \frac{3·375}{17·5} = \underline{·1928571}. \text{ Ans.}$$

FEMALES.

1. Make out the following bill:—28½ yards of flannel at 3s. 4d. per yard; 35 yards of calico at 5½d. per yard; 3½ dozen pairs of stockings at 18s. 6d. per dozen; 7 pairs of gloves at 3s. 3d. per pair; 12¼ yards of Irish linen at 5s. 6d. per yard; 4 pairs of muslin curtains at 12s. 8d. per pair.

| | | s. | d. | | | £ | s. | d. |
|---|---|---|---|---|---|---|---|---|
| 28½ yards | at | 3 | 4 | per yard | = | 4 | 15 | 0 |
| 35 ,, | ,, | 0 | 5½ | ,, | = | 0 | 16 | 0½ |
| 3½ dozen | ,, | 18 | 6 | per dozen | = | 3 | 4 | 9 |
| 7 pairs | ,, | 3 | 3 | per pair | = | 1 | 2 | 9 |
| 12¼ yards | ,, | 5 | 6 | per yard | = | 3 | 7 | 4½ |
| 4 pairs | ,, | 12 | 8 | per pair | = | 2 | 10 | 8 |
| | | | | | | 15 | 16 | 7 Ans. |

2. A person exchanged 18 dozens of wine for a gold snuff-box weighing 8 ozs. 13 dwts. 10 grs. valued at £4 10s. an oz. What did he value his wine at per dozen?

| | | | £ | s. | d. |
|---|---|---|---|---|---|
| Value of 1 oz. of gold = | | | 4 | 10 | 0 |
| | | | | | 8 |
| ,, 8 ,, ,, | = | | 36 | 0 | 0 |
| ,, 10 dwts. ,, | = ½ | value of 1 oz. = | 2 | 5 | 0 |
| ,, 2 ,, ,, | = ⅕ | ,, 10 dwts. = | 0 | 9 | 0 |
| ,, 1 ,, ,, | = ½ | ,, 2 ,, = | 0 | 4 | 6 |
| ,, 8 grs. ,, | = ⅓ | ,, 1 ,, = | 0 | 1 | 6 |
| ,, 2 ,, ,, | = ¼ | ,, 8 grs. = | 0 | 0 | 4½ |
| | | Total value of gold = | 39 | 0 | 4½ |

∴ the wine must have been valued at £39 0s. 4½d. for 18 doz.; that is, the value of 1 doz. = £39 0s. 4½d. ÷ 18 = £2 3s. 4½d.

3. Find the value of 2 tons 1 cwt. 3 qrs. 27 lbs., at 9½d. per lb.

(1) 2 tons 1 cwt. 3 qrs. 27 lb. = 41 cwt. 3 qrs. 27 lbs.
= 167 qrs. 27 lbs.
= 4703 lbs.

(2) 4703 lbs. at 9½d. per lb. = 44678½d.
= 3723s. 2½d.
= £186 3s. 2½d. Ans.

4. Find the least common multiple of 56, 64, 70, 84, 112.

| | | | | | |
|---|---|---|---|---|---|
| 7 | 56, | 64, | 70, | 84, | 112 |
| 4 | 8, | 64, | 10, | 12, | 16 |
| 2 | 2, | 16, | 10, | 3, | 4 |
| 2 | 1, | 8, | 5, | 3, | 2 |
| | | 4, | 5, | 3, | 1 |

L.C.M. = 7×4×2×2×4×5×3 = 6720. Ans.

5. Find the value of $4 - 1\frac{2111}{2222}$.

$4 - 1\frac{2111}{2222} = 3\frac{2222}{2222} - 1\frac{2111}{2222} = \underline{2\frac{111}{2222}}$. Ans.

## Grammar.

1. 'Small service *is true service* while it lasts
Of humblest friends, bright Creature, *scorn not one;*
The daisy by the shadow *that it casts*
*Protects* the *lingering* dew-drop from the sun.'
—WORDSWORTH.

(*a*) Parse the words printed in italics.

(*b*) Analyse the third and fourth lines.

(*a*) *Is*—irreg. intrans. verb, *am, was, been*, indic., pres. indef., 3rd pers., sing., agr. with subj. 'service.'

*true*—adj., qual. 'service.'

*service*—abst. noun, neut., sing., nom. after 'is.'

*scorn*—reg. trans. verb., imper., pres. indef., agr. with subj. ('thou').

*not*—adv., negative, mod. 'scorn.'

*one*—indef. adj. pron., mas. or fem., sing., obj., gov. by 'scorn.'

*that*—simple rel., referring to 'shadow,' neut., 3rd pers., sing., obj., gov. by 'casts.'

*it*—pron., referring to 'daisy,' 3rd pers., sing., neut., nom., subj. of 'casts.'

*casts*—irreg. trans. verb, *cast, cast, cast*, indic., pres. indef., 3rd pers., sing., agr. with subj. 'it.'

*protects*—reg. trans. verb, indic., pres. indef., 3rd. pers., sing., agr. with subj. 'daisy.'

*lingering*—part. adj., qual. 'dew-drop.'

(*b*) (1) Principal sentence:—The daisy by the shadow protects the lingering dew-drop from the sun.

(2) Subordinate adjective sentence:—That it casts.

| | (1) | (2) |
|---|---|---|
| Subject | the daisy | it |
| Predicate | protects | casts |
| Object | the lingering dew-drop | that |
| Extension | from the sun (*complement*)... by the shadow (*means*). | |

2. Write out the present, past, and future tenses of the verb to be.'

Singular.

| | 1. | 2. | 3. |
|---|---|---|---|
| Present | (I) am, | (thou) art, | (he) is. |
| Past | ,, was, | ,, wast, | ,, was. |
| Future | ,, shall be, | ,, wilt be, | ,, wilt be. |
| | ,, will be, | ,, shalt be, | ,, shalt be. |

Plural.

| | 1. | 2. | 3. |
|---|---|---|---|
| Present | (We) are, | (you) are, | (they) are. |
| Past | ,, were, | ,, were, | ,, were. |
| Future | ,, shall be, | ,, will be, | ,, will be. |
| | ,, will be, | ,, shall be, | ,, shall be. |

3. Take the word *hard*. Add a syllable which will turn it into an adverb, another which will turn it into a verb, and another which will turn it into a noun. Give in each case four examples of other words similarly formed.

| Adjective. | Adverb. | Verb. | Noun. |
|---|---|---|---|
| Hard | hardly | harden | hardness |
| Soft | softly | soften | softness |
| Noble | nobly | ennoble | nobleness |
| Low | lowly | lower | lowness |
| Glad | gladly | gladden | gladness |

## Geography.

(*Answer either Question* 1 *or Question* 2, *not both.*)

1. Draw a full map of the six northern counties of England.

2. Describe the course of a ship keeping close to the coast from Whitehaven to Greenock, naming the chief objects of interest to be seen on the way.

Draw a map to illustrate the description.

Leaving Whitehaven, a coal-port to the north of St. Bee's Head, we pass Workington and Maryport, having also considerable trade in coal and iron. As we proceed past the small ports of Allonby and Silloth, we note the ridges of the Pennine Mountains in the interior. As we near Port Carlisle we observe the Solway viaduct; and turning from the mouth of the Esk, our course is exactly reversed as we proceed to Annan, a small seaport on the Solway. From Annan our westerly course brings us to the Nith, on which stands the well-built town of Dumfries. Turning south-west, we come to Kirkcudbright, a very pretty town at the head of the estuary of the Dee. Sailing up to Wigtown, we pass Creetown, noted for its grand quarries. Passing Burrow Head and the wide gap of Luce Bay, we round the Mull of Galloway, and reach Port Patrick, a packet-station for Ireland. Rounding Corsewall (Corsill) Point, we might visit Stranraer, at the head of Loch Ryan, and then return to proceed up the Frith of Clyde, past Ballantrae, Girvan (opposite which is Ailsa Craig, a great resort of Solan geese), and visit Ayr to see the 'Land of Burns.' Passing the busy ports of Troon, Irvine, and Ardrossan, we have a fine view of Arran on the left, and further north the islands of Great and Little Cumbrae, with Bute in the background. Soon after we reach Largs, and entering the Clyde, we reach the busy seaport of Greenock. The Frith of Clyde, with its beautiful islands and splendid mountain scenery, stands unrivalled among British estuaries.

3. Describe fully the physical features of South Australia.

The principal series of mountains in South Australia is that which extends from Cape Jervis to the region east of Lake Torrens. Several peaks in that range attain a height of above 3000 feet. The region further north consists of a series of stony table-lands, generally poorly clad with vegetation, with alluvial plains between, on which vegetation is most luxuriant and the best pasture is found. Beyond the table-land region there extends, as far as Cooper's Creek, a region occupied by low ridges of dazzling white sand-hills stretching away for hundreds of miles in a north and westerly direction. This, on account of long droughts, has been called the Central Desert. The areas between the sand-hills are periodically inundated by the overflowing of the rivers that wind through them, and which become swollen in consequence of heavy rains within the tropics. The greater part of the rest of the surface, so far as is known, is flat and uninteresting, to a large extent desert; but even in the most inland parts much good land was discovered by those laying the trans-continental line of telegraph. In the Northern Territory, in Arnhem Land, there is an extensive table-land. Except in the Northern Territory, the Murray River, which has the lower part of its course in South Australia, is the only river of importance which permanently reaches the sea. Though navigable throughout its course in this colony and a long way higher up, it unfortunately has its mouth encumbered with a shifting bar, which makes the navigation inwards and outwards very dangerous and difficult. In this colony lie the principal lakes of Australia, and these, having no outlet, are all more or less salt. The chief are Lakes Eyre, Torrens, and Gairdner. Further north occurs the large salt lake of little depth, named Lake Amadeus.

## History.

1. For what purpose did the Romans build walls across Britain? Give name and position of any such walls.

The Romans built ramparts or walls across Britain for the purpose of protecting the southern part of the island from the incursions of the fierce predatory tribes of Caledonia.

Agricola's Wall was built from the Firth of Forth to the Firth of Clyde.

Hadrian's Wall was built from the Tyne to the Solway (120 A.D.).

Agricola's Wall was renewed by the Emperor Antonine (140).

Severus, in 211 A.D., built a new stone wall along the line of Hadrian's.

2. What kingdoms were founded by the Saxons, Angles, and Jutes respectively? Mention names of counties which will show this origin.

About 450 A.D. certain Jutes landed in England, and eventually founded the *kingdom of Kent*, settling in the parts which are now Kent, south of Hampshire, and the Isle of Wight.

About 476 a body of Saxons landed, and finally founded and named a *kingdom of Sussex*, which included Sussex and a large part of Surrey.

In 495 a large body of Saxons landed, and in 519 completed the founding of the *kingdom of Wessex*. This included the country west of Sussex and south of the Thames, except Devon and Cornwall.

About 527 other Saxon invaders founded the *kingdom of Essex*, which included Middlesex and Essex.

During the sixth century the Angles made their appearance, and founded a kingdom called *East Anglia*, including Norfolk, Suffolk, and Cambridgeshire.

About 547 they also began to form the future *kingdom of Northumbria*, and about 626 Anglian chiefs conquered the centre of the country, which became the *kingdom of Mercia*.

The Angles in time gave their name to the whole country, 'Englaland' being shortened into 'England.' The termination *-sex* in Essex, Sussex, Middlesex, commemorates the presence of the Saxons.

3. What was the connection between the Danes and the Normans?

The Danes and Normans, that is, Northmen, both belonged to the great Scandinavian race, a people closely connected with the Saxons and Angles in blood, religion, and language, and originally inhabiting Norway, Sweden, and Denmark.

### Composition.

Write from memory the substance of the passage read to you by the inspector.

Thackeray says:—

'I came from India as a child, and our ship touched at an island on the way home, where my black servant took me a long walk over rocks and hills, until we reached a garden, where we saw a man walking. "That is he," said the black man: "that is Bonaparte! He eats three sheep every day and all the little children he can lay hands on." At that time there were many people in the British dominions, besides this poor Calcutta serving man, with an equal horror of "the Corsican ogre," as they called him.'

### Music.

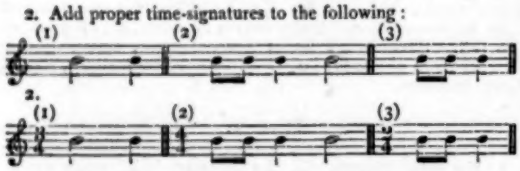
*A quarter of an hour allowed for this paper.*

1. Write above each of the following notes its pitch-name (C, D, or *Do*, *Re*, &c.), and below write the signs for rests corresponding in value to the notes:

1.




2. Add proper time-signatures to the following:




2.




3. Write below each of the following intervals its name (major fourth, &c.):

3.




### TONIC SOL-FA NOTATION.

1. Write (using three-pulse measure) one note continued through six pulses.

1. |1 :— :— |— :— :— ‖

2. Write the ascending scale from *doh* to *doh*¹.

2. *doh ray me fah soh lah te doh*¹

3. Write the names of the following intervals: (1) *fah* to *lah*, (2) *soh* to *te*, (3) *soh* to *ray*₁, (4) *fah* to *te*.

3. (1) Major 3rd. (2) Major 3rd. (3) Perfect 5th. (4) Pluperfect 4th.

## SECOND YEAR.

### Pupil Teachers at end of Second Year.

*Three hours and a half allowed for this Paper.*

### Arithmetic.

MALES.

1. What sum of money, laid out at simple interest for $3\frac{1}{2}$ years at 4 per cent. per annum, will amount to £805 2s. 6d.?

Interest of £100 for $3\frac{1}{2}$ yrs. at 4 p.c. $= £4 \times 3\frac{1}{2} = £14$
Amount of " " " " $= £(100+14) = £114$
$\therefore$ £114 : £$805\frac{1}{2}$ :: £100 : sum required.
8 8
912 6441
$$\frac{£100 \times 6441}{912} = £706\ 5s.$$ Ans.

2. If a man pays 2s. 6d. a month for the loan of £20, what rate of interest per cent. per annum does he pay?

2s. 6d. per month = £1 10s. per annum.
$\therefore$ £20 : £100 :: £1 10s. : rate p.c.
$$\frac{£1\ 10s. \times 100}{20} = £7\tfrac{1}{2}\text{ p.c.}$$ Ans.

3. Find the difference between the true and a banker's discount on a bill of £769 10s., due 4 months hence, interest being at $3\frac{3}{4}$ per cent. per annum.

(1) True discount:
Interest of £100 for 4 mos. at $3\frac{3}{4}$ p.c. $= £3\frac{3}{4} \times \frac{4}{12} = £1\frac{1}{4}$
Amount " " $= £101\frac{1}{4}$
$\therefore$ £$101\frac{1}{4}$ : £$1\frac{1}{4}$ :: £$769\frac{1}{2}$ : true discount.
4 4 2
405 5 1539
$$£\tfrac{1232}{4} \times \tfrac{2}{385} = £\tfrac{2464}{1540} = £9\ 10s.$$

(2) Banker's discount or simple interest:
Interest on £769 10s. for 4 mos. at $3\frac{3}{4}$ p.c. $=$
$$769\ 10s. \times \frac{4}{12} \times \frac{3\frac{3}{4}}{100} = £769\tfrac{1}{2} \times \frac{4 \times 15}{12 \times 400}$$
$$= \frac{£1539 \times 4 \times 15}{2 \times 12 \times 400}$$
$$= £\tfrac{92340}{1600} = £9\ 12s.\ 4\tfrac{1}{2}d.$$
$\therefore$ Diff. between true and banker's discount
$= £9\ 12s.\ 4\frac{1}{2}d. - £9\ 10s.$
$= \underline{2s.\ 4\frac{1}{2}d.}$ Ans.

4. If I invested £2624 in $4\frac{1}{2}$ per cent. railway debentures at $127\frac{1}{2}$, what income should I derive therefrom, the usual brokerage being charged?

Price of £100 in railway debentures, including brokerage $= £128$, and since £128 invested brings £$4\frac{1}{2}$, $\therefore$ the income is found from the following proportion:—
£128 : £2624 :: £$4\frac{1}{2}$ : income.
$$\frac{£4\ 10s. \times 2624}{128} = \frac{£4\ 10s. \times 41}{2}$$
$$= £2\tfrac{1}{2} \times 41 = £92\ 5s.$$ Ans

5. A and B join in partnership, each with £500, and at the end of 8 months A puts in £200 more, and B takes out £200. How should a profit of £120 be divided at the end of a year?

£ £ £
A $(500 \times 8) + (700 \times 4) = 6800$
B $(500 \times 8) + (300 \times 4) = 5200$
12000
$\therefore$ A's profit $= \frac{6800}{12000}$ of £120 $= £68$. Ans.
And hence B's profit £120 − 68 $= £52$. Ans.

FEMALES.

1. Simplify $\frac{3}{5}$ of $6\frac{7}{10} - \frac{5}{9}$ of $4\frac{8}{15}$.
$$\tfrac{3}{5} \text{ of } 6\tfrac{7}{10} - \tfrac{5}{9} \text{ of } 4\tfrac{8}{15} = \frac{2 \times 67}{3 \times 10} - \frac{5 \times 68}{9 \times 15}$$
$$= 4\tfrac{7}{15} - 2\tfrac{1}{9}$$
$$= 4\tfrac{63}{135} - 2\tfrac{30}{135} = 1\tfrac{133}{135}.$$ Ans.

2. What fraction must be added to the sum of $\frac{1}{11}$, $\frac{2}{15}$, and $\frac{3}{91}$ to make the result a whole number?
$$\tfrac{1}{11} + \tfrac{2}{15} + \tfrac{3}{91} = \frac{1274 + 2835 + 390}{4095}$$
$$= \tfrac{4499}{4095}$$
$$= 1\tfrac{404}{4095}$$
$\therefore$ The fraction required $= 2 - 1\frac{404}{4095} = \frac{3691}{4095}$. Ans.

3. Simplify $\frac{2\frac{3}{4} \text{ of } \frac{5}{7}}{6\frac{2}{7} \text{ of } \frac{3}{11}} \div \frac{1\frac{1}{2}}{9}$

$$\frac{2\frac{3}{4} \text{ of } \frac{5}{7}}{6\frac{2}{7} \text{ of } \frac{3}{11}} \div \frac{1\frac{1}{2}}{9} = \frac{\frac{8 \times 5}{7 \times 11}}{\frac{3 \times 7}{44 \times 3}} \div \frac{1\frac{1}{2}}{9}$$

$$= \frac{\frac{40}{77}}{\frac{1}{44}} \div \frac{1\frac{1}{2}}{9}$$

$$= \frac{40 \times 7 \times 81}{21 \times 12 \times 10} = 9. \text{ Ans.}$$

4. Find the fraction of £1, which is equivalent to $\frac{3}{5}$ of a guinea, above the sum of $\frac{3}{4}$ of a shilling, and $\frac{5}{6}$ of 7s. 6d.

$$\tfrac{3}{5} \text{ gui.} - \tfrac{3}{4}\text{s.} + \tfrac{5}{6} \text{ of 7s. 6d.} = 14\text{s.} - (9\text{d.} + 3\text{s. 4d.})$$
$$= 14\text{s.} - 4\text{s. 1d.}$$
$$= 9\text{s. 11d.}$$

$\therefore$ The fraction required $= \frac{9\text{s. 11d.}}{£1} = \underline{\frac{119}{240}}$. Ans.

5. Express $1\frac{3}{5}$ of $11\frac{1}{4}$ and $\frac{12\frac{3}{4}}{10\frac{1}{2}}$ as decimals.

(1) $1\frac{3}{5}$ of $11\frac{1}{4} = \frac{17 \times 45}{15 \times 4} = \frac{51}{4} = \underline{12{\cdot}75}$. Ans.

(2) $\frac{12\frac{3}{4}}{10\frac{1}{2}} = \frac{51}{4} \div \frac{21}{2} = \frac{51 \times 2}{4 \times 51} = \underline{1{\cdot}25}$. Ans.

## English Grammar and Composition.

1. 'By torch and trumpet fast arrayed,
*Each horseman drew* his battle-blade,
And *furious* every charger neighed
To join the dreadful revelry.

'*Then shook the hills* with thunder *riven*,
Then rushed the steed to battle driven,
And *louder than the bolts* of heaven
Far flashed the red *artillery*.'

(*a*) Paraphrase this passage.
(*b*) Analyse the second stanza.
(*c*) Parse the words printed in italics.

(*a*) The soldiers, roused by the sound of the bugle, were arranged by the light of torches, and unsheathing their swords, stood ready for the fray, while the war-horse gave signs of eagerness to enjoy the terrible sport of battle. Then while the surrounding heights re-echoed the pealing thunder, the cavalry charged; and, as the sound of cannon drowned the thunders of nature, the flash of the guns vied with the lightning.

(*b*)

| Sentence. | Kind. | Subject. | Predicate. | Object. | Extension. | Connective. |
|---|---|---|---|---|---|---|
| (1) Then shook the hills with thunder riven. | Principal | the hills riven with thunder | shook | .. | then (time) | |
| (2) Then rushed the steed to battle driven. | Principal | the steed driven to battle | rushed | .. | then (time) | |
| (3) And louder than the bolts of heaven far flashed the red artillery. | Principal | the red artill'ry, louder than .... heaven | flashed | .. | far | and |
| (4) Than the bolts of heaven (are loud). | Subord. adv. of comp'rison to (3) | the bolts of heaven | (are loud) | .. | | than |

(*c*)
*Each*—distrib. adj., qual. 'horseman.'
*horseman*—noun, com., mas., sing., nom., subj. of 'drew.'
*drew*—verb, trans., irreg., *draw, drew, drawn*, indic., past indef., 3rd pers., sing., agr. with subj. 'horseman.'
*furious*—adv. of manner, mod. 'neighed.'
*then*—adv. of time, mod. 'shook.'
*shook*—verb, intrans., irreg., *shake, shook, shaken*, indic., past indef., 3rd pers., plur., agr. with subj. 'hills.'
*the*—dist. adj., or def. art., limiting 'hills.'
*hills*—noun, com., neut., plur., nom., subj. of 'shook.'
*riven*—complete part. of the irreg. verb *rive, rove, riven*, predicative of 'hills.'
*louder*—adj., compar. deg., qual. 'artillery.'
*than*—subord. conj., connecting subord. sent. 'the bolts of heaven (are loud)' with the prin. sent. 'the red artillery,' etc.
*the*—dist. adj., or def. art., limiting 'bolts.'
*bolts*—noun, com., neut., plur., nom., subj. of ('are').
*artillery*—noun, com., collective, neut., sing., nom., subj. of 'flashed.'

2. Illustrate from the above extract the difference between transitive and intransitive verbs.

Transitive verbs take an object after them; as, 'Each horseman drew (trans. verb) his battle-blade (obj.)'; 'to join (trans. verb) the dreadful revelry (obj.).'

Intransitive verbs do not take an object; as, 'Furious every charger neighed (intrans.)'; where the action in 'neighing' is confined to the subject 'charger.' Other examples are: 'Then *rushed* the steed'; 'Then *shook* the hills'; 'Far *flashed* the red artillery.'

3. What is the use of the first syllable in each of the following words:—*Sub*marine, *In*distinct, *Pre*fix. Give three examples of similar formations.

*Sub* is used here to modify the meaning of marine. It means 'under,' and so 'submarine' means 'under the sea.'

*In*, for a similar reason, means 'not.' Indistinct is therefore 'not distinct.'

The *pre* in 'prefix' means 'before,' prefix meaning either 'to place before,' or 'syllable placed before another word.'

Three others examples are: *com*pose, 'to place together'; *trans*port, 'to carry across'; *a*vert, 'to turn away something from.'

## Geography.

*Answer either Q. 1 or Q. 2; not both.*

1. What effect have mountains on climate? Illustrate your answer by reference to the eastern and western sides of Great Britain, and the northern and southern slopes of the Alps.

On land climate depends to a great extent on the altitude, for on ascending a high mountain from a plain the traveller meets with changes in the character of the animal and vegetable life which are similar to those changes which may be observed in passing from low to high latitudes. Even within the tropical zone the highest points of the existing high lands are covered with perpetual snow.

The slope of the country at noon greatly affects the climate, especially in the temperate zone. If the slope is towards the sun at noon, his rays fall more directly on the surface, and therefore produce a greater effect than if the place is level; while, on the other hand, if the surface incline in an opposite direction, the contrary effect is produced. Thus the climate of Great Britain is much affected by the rainfall, which is much greater on the W. than on the E., and this great difference arises from the configuration of the land and the general prevalence of westerly winds charged with vapour from the Atlantic. These winds, striking against the colder mountain-ranges, lose their moisture and originate all the principal rivers in Britain. The effect of aspect is well exemplified by the fact that on the southern slopes of the Alps of the Valais the vine attains to its utmost perfection, while the northern slope is densely covered with ice and snow. Of all the Swiss Cantons, Ticino, as being on the south side of the Alps, enjoys the warmest climate. The snow limit of the Alps is also 600 ft. higher on the south than on the north side.

2. Describe fully the basin of the Danube.

The Danube, from where it rises in the Black Forest to Passau, a distance of nearly 300 miles, is chiefly a Bavarian river; from Passau to Orsova, twice as far, it passes through Austrian territory; and throughout the remaining part of its course it flows through European Turkey, dividing Bulgaria from Roumania. Its course is calculated to be about 1770

miles, and it drains at least 300,000 square miles of area. It is augmented by sixty large tributary rivers, and passes into the Black Sea nearly as great a volume of water as all the other rivers that flow into that sea. The upper course passes through the famous scenery of the Black Forest and the fertile plains of Hungary; the middle course flows through a district which excels almost any European country for natural productions. Below Belgrade, where the river is joined by the Save, the Danube flows for sixty miles through an undulating tract, until its bed is narrowed by the approach of the Carpathians and Balkans. Near the termination of this defile is the famous 'Iron Gate.' With the exception of the Delta and its course between Bulgaria and Wallachia, the scenery on the Danube is picturesque and impressive, at one time flanked by mountains, and again by far-extending forests.

3. Describe the productions of the different parts of British India, and draw a map to illustrate your answer. Insert the lines of the latitude and longitude.

*Wheat* is grown in the N.W. provinces; *barley* and *millet* in the Nilgiri hills; and *rice*, the principal food of most of the inhabitants along the Lower Ganges. *Cotton* is cultivated in Bengal, Burma, Assam, and Nagpore. *Jute* is cultivated in Bengal, Bombay, and other parts. *Indigo* is the chief product between the Upper Ganges and the Himalayas. *Opium* grows in the Middle Ganges and in Malwa, forming one of the sources of revenue. *Tea* is produced in Assam, and *coffee* in Ceylon. There are extensive forests, with a great variety of useful *timber* trees, such as bamboo, teak, satin-wood, iron-wood, mulberry, banyan, etc. *Iron* and *coal* are worked near Nagpore, in Bengal. *Silver* is found in the jungles of Bengal; *gold* in the Punjaub and on the coast of Malabar; *diamonds* in the central provinces and at Golconda; the mines are now exhausted.

## SECOND PAPER.

*Two hours and a half allowed.*

### History.

1. Write down a list of the Norman kings, with the dates of their accession.

| | A.D. |
|---|---|
| William I. (the Conqueror) began to reign | 1066 |
| William II. (Rufus) " " | 1087 |
| Henry I. (Beauclerc) " " | 1100 |
| Stephen (Count of Blois) " " | 1135 |

2. Who was Henry II.? Trace the course of events which placed him on the throne.

Henry II. was the son of Geoffrey of Anjou and Maud, daughter of Henry I. of England.

His mother, Maud, should have succeeded to the vacant throne on the death of Henry I.; but the crown was claimed and usurped by Stephen. Stephen, by numerous concessions, gained a strong party to support him; but David of Scotland invaded England three times in Maud's favour, and in 1138 he suffered a complete defeat at the Battle of the Standard. In 1141 Stephen was taken prisoner at the battle of Lincoln, and Maud was acknowledged queen by the Clergy. By an exchange of prisoners Stephen was set free, and sat again on the throne. Maud was besieged in Oxford, 1142, but escaped and remained four years longer in the country, during which she was acknowledged in the western half of the kingdom. She at length lost her chief supporters and retired to Normandy. Her son Henry had during these years being growing up, and had succeeded, on the death of his father, to Normandy and Anjou. He had also gained by marriage the province of Aquitaine. Considering himself powerful enough, he invaded England to wrest from Stephen the crown of his grandfather. The death of Stephen's son Eustace hindered the war, and a treaty was made by which Stephen acknowledged Henry heir to the English throne (1154).

3. How came the Great Charter to be granted? Mention its leading provisions.

King John, by his tyranny, had so roused the enmity of the barons that they resolved to put a check upon his actions, and in spite of the king's friendship with Rome, Archbishop Stephen (Langton) and the English Church gave their aid to the cause of freedom. In 1214 the confederate barons took an oath to withdraw their allegiance if John refused their demands. At Easter, 1215, they assembled their forces; but John swore he would never grant them liberties which would make him a slave. However, when the confederates marched, under Robert Fitz-Walter, upon London, and were willingly admitted, he was brought to submit. At Runnymede, a meadow near Windsor, on June 15th, 1215, the king met the barons and sealed the Charter which embodied their demands.

The chief provisions of Magna Charta were that no scutage could be levied without the consent of the king's tenants in council (except to ransom the king from captivity, to provide for the expenses of making his eldest son a knight, or of giving his eldest daughter in marriage); that no freeman was to be imprisoned, deprived of his lands, or outlawed, except by the law of the land and the judgment of his peers; that all men might leave England and return to it when they pleased; that the prerogatives of purveyance and pre-emption should not be abused; and that there should be a fixed standard of weights and measures.

### Teaching.

Give some examples of the sort of mental exercise you would give to young children on the arithmetic *of a shilling*.

After making sure that the children have a real acquaintance with the farthing, halfpenny, penny, threepenny-piece, fourpenny-piece, sixpence, and shilling, the following exercises might be given:—

How many pennies (threepences or fourpences) in exchange for 1s.?

How many halfpence for 1d. (or 2d., 3d., etc.)?

How many twopenny, threepenny, fourpenny books for 1s.?

Find the cost of two books at 3d. each, at 4d., etc., and tell how much remains out of 1s.

What have I left out of a shilling after paying for a reading-book at 3d., a slate at 2d., and a copy at 4d.?

James took a shilling to buy 2 lbs. of sugar at 4d. a lb. What was his change?

How many boys will get a halfpenny each out of 6d., 8d., etc.?

What is the half of 1s.? the third? the fourth? the sixth?

### Euclid.

MALES.

[All generally understood abbreviations for *words* may be used.]

1. Upon the same base, and on the same side of it, there cannot be two triangles that have their sides which are terminated in one extremity of the base, equal to one another, and likewise those which are terminated in the other extremity.

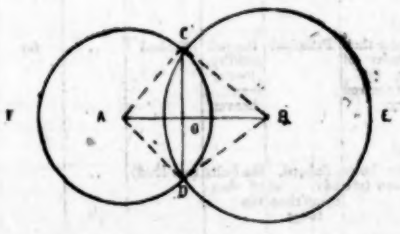
Prop. 7, Bk. I.

2. If two triangles have two sides of the one equal to two sides of the other, each to each, but the angle contained by the two sides of one of them greater than the angle contained by the two sides equal to them, of the other; the base of that which has the greater angle shall be greater than the base of the other.

Prop. 25, Bk. I.

3. If two circles cut each other, the line joining their points of intersection is bisected at right angles by the line joining their centres.

Let the two circles DEC, DFC intersect at the points D and C, and let A and B be the centres of the circles. Join AB, DC, then AB shall bisect DC at right angles in the point G.



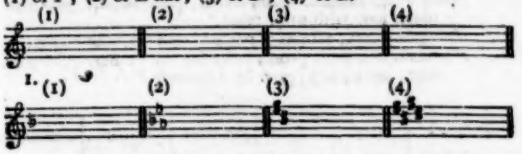

Because B is the centre of the circle DEC, BC=BD; and because A is the centre of the circle FCD, AC=AD; then, in the triangles CBA, DBA, the two sides CB, BA=the two DB, BA, and the base CA=the base DA; ∴ (I. 8.) ∠CBA=∠DBA.

Again, in the triangles CBG, DBG; CB=BD, and BG is common, and $\angle CBG = \angle GBD$; then (I. 4.) the base CG= base GD, and $\angle CGB = \angle DGB$, and they are adjacent angles; $\therefore$ each of them is a $\angle$ right, and therefore, since CG=GD, and the angles BGC, BGD are right angles, then BA bisects CD at right angles. Q. E. D.

### Music.

*A quarter of an hour allowed for this paper.*

1. Write the key-signature of each of the following major keys (1) of F; (2) of E flat; (3) of D; (4) of E.




1. (1) (2) (3) (4)

2. Write down all the major thirds found between the notes of the scale of C major.

2.

3. Add the time-signatures to each of the following:

3. (1) (2) (3)

### TONIC SOL-FA NOTATION.

1. What is the mental effect of *lah*? and of *me*?

1. *Lah* is mournful, *me* calm and steady.

2. Write down the major thirds found between the notes of the common major scale.

2. (1) *Doh* to *me*; (2) *fah* to *lah*; (3) *soh* to *te*.

3. Write the pulse-signs for nine-pulse measure.

Primary form.

3. | : : | : : | : : ||

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## THIRD YEAR.

**Pupil Teachers at end of Third Year,** *if apprenticed on, or after,* **1st *May,* 1878; and Pupil Teachers at end of Fourth Year,** *if apprenticed before that date.*

*Three hours and a half allowed.*

### Arithmetic.

MALES.

1. If a grocer, by retailing butter at 1s. 1½d. per lb., gains 12 per cent., what did it cost him per cwt.?

Retail price of 1 cwt. = 1s. 1½d. × 112 = 126s.

$\therefore$ 112 : 126 :: 100s. : prime cost of 1 cwt.

$$\frac{100s. \times 126}{112} = \frac{£5 \times 9}{8} = £5\ 12s.\ 6d.$$ Ans.

2. What sum of money must I invest in the 3 per cents. at 97⅛, in order to get a dividend of £240, the usual brokerage being charged?

Price of £100, including brokerage, is 97½, which brings an income of £3.

$\therefore$ 3 : 240 :: £97½ : amount of investment.

$$\frac{£97\frac{1}{2} \times 240}{3} = £7800.$$ Ans.

3. Find the true discount on a bill of £1,046 15s. 6d., due September 25th, but discounted May 2nd, interest being at 5 per cent. per annum.

No. of days before the bill is due = 29 + 30 + 31 + 31 + 25 = 146 days.

Interest on £100 for 146 days at 5 per cent. $= \frac{5 \times 146}{365} = £2$

Amount " " " $= £102$

$\therefore$ 102 : 2 :: £1046 15s. 6d. : discount required.

$$\frac{£1046\ 15s.\ 6d. \times 2}{102} = \frac{£1046\ 15s.\ 6d.}{51} = £20\ 10s.\ 6d.$$ Ans.

4. State the rule for pointing in square root. Extract the square root of ½ and of ·0000421 each to 4 decimal places.

*Rule for pointing in square root.*—Place a point over the unit and over every second figure from it in both directions. If there be any decimal places add a cipher if necessary, so that the last figure shall be pointed.

(*a*)

$\sqrt{\frac{1}{2}} = \sqrt{·5}$

| | |
|---|---|
| | ·50(·7071... Ans. |
| | 49 |
| 1407 | 10000 |
| | 9849 |
| 14141 | 15100 |
| | 14141 |
| | .... |

(*b*)

| | |
|---|---|
| | ·0000421...(·0056... Ans. |
| | 25 |
| 106 | 1711 |
| | 636 |
| | ... |

5. Find without reducing to fractions the value of $3·4\dot{6} + 5·2\dot{7}\dot{3} - 4·\dot{3}0\dot{3}$.

$$\begin{array}{rl} 3·4\dot{6} = & 3·4666666 \\ +5·2\dot{7}\dot{3} = & 5·2737373 \\ & 8·7404040 \\ -4·\dot{3}0\dot{3} = & -4·3033033 \\ & 4·437100\dot{7}. \end{array}$$ Ans.

FEMALES.

1. Work the following examples and prove the truth of each result by fractions:—

1000·1 − 9·01, 2·0065 × ·005, 2·0125 ÷ 35.

Proof of (*a*)

(*a*)

1000·1
9·01
991·09. Ans.

$1000·1 - 9·01 = \frac{10001}{10} - \frac{901}{100} = \frac{100010 - 901}{100} = \frac{99109}{100} = 991·09.$ Q. E. D.

(*b*)

2·0065
·005
·0100325

Proof of (*b*)

$2·0065 \times ·005 = \frac{20065}{10000} \times \frac{5}{1000} = \frac{100325}{10000000} = ·0100325.$ Q. E. D.

(*c*)

35)2·0125(·0575
175
262
245
175
175

Proof of (*c*)

$2·0125 \div 35 = \frac{20125}{10000} \div \frac{35}{1}$

$= \frac{20125 \times 1}{10000 \times 35}$

$= \frac{4025}{2000} \times \frac{1}{175}$

$= 575 \times \frac{1}{100000}$

$= \frac{575}{1000} = ·0575.$ Q. E. D.

2. Divide 12·003 by 54·1 to three places of decimals, and prove the truth of the result.

54·1)12·003('221...
1082
1183
1082
1010
541
.....

*Proof by Vulgar Fractions.*

$12{\cdot}003 \div 54{\cdot}1 = \frac{12{\cdot}003}{10000} \div \frac{541}{10}$
$= \frac{12{\cdot}003}{10000} \times \frac{10}{541}$
$= \frac{12{\cdot}003}{541} \times \frac{10}{10000}$
$= 221... \times \frac{1}{1000}$
$= \frac{221...}{1000}$
$= {\cdot}221...$ Q. E. D.

3. A farmer sold 5 loads of barley, each containing 34 bushels 2½ pks., for £40 7s. 11d. How much ought 100 qrs. of the same barley to be worth?

34 bus. 2½ pks. × 5 = 173 bus. 0½ pks.

173 bus. 0½ pks. : 100 qrs. :: £40 7s. 11d. : ?

| | | |
|---|---|---|
| 4 | 8 | 20 |
| 692 pks. | 800 bus. | 807s. |
| 2 | 4 | 12 |
| 1385 | 3200 pks. | 9695d. |
| | 2 | |
| | 6400 | |

$\frac{9695\text{d.} \times 6400}{1385} = 7\text{d.} \times 6400$
$= 44800\text{d.}$
$= 3733\text{s. } 4\text{d.}$
$= £186\ 13\text{s. } 4\text{d.}$ Ans.

4. At the rate of $\frac{7}{15}$ of a mile a minute a train takes 3½ hours to reach a station; how long would it take at the rate of $\frac{7}{15}$ of a mile per minute?

$\frac{7}{15}$ ml. : $\frac{7}{15}$ ml. :: 3½ hrs. : time required.

$3\frac{1}{2}\text{ hr.} \times \frac{7}{15} \times \frac{7}{15} = \frac{13\text{ hrs.} \times 5 \times 15}{4 \times 13 \times 7}$
$= \frac{75}{56}\text{ hr.} = 2\text{ hrs. } 40\text{ min. } 42\frac{6}{7}\text{ secs.}$ Ans.

## English Grammar and Composition.

1. I was yesterday, about sunset, walking in the open fields, until the night *insensibly fell* upon me. I, at first, amused *myself* with all the richness and variety of colours which appeared in the western part of heaven. [In proportion *as they faded away* and went out, several stars and planets appeared one after another until the whole firmament was in a glow.] The blueness of the ether was exceedingly *heightened* and enlivened by the season of the year, and by the rays of all those luminaries *that passed through it*. To complete the scene, the full moon rose at length in clouded majesty. ADDISON.

(*a*) Rewrite this passage in your own words.
(*b*) Parse the words printed in italics.
(*c*) Analyse the sentence enclosed in brackets.
(*d*) Select from the passage any words which you know by their termination to be derived from the Latin language, and give in each case another example of a word similarly formed.

(*a*) Last evening, when the sun was going down, I strolled through the fields, until still evening stole upon me. The glorious colours painted by the disappearing sun upon the sky kept me wrapt in admiration. As these hues gradually died away, the various smaller heavenly bodies as gradually came in sight, until the whole vault of heaven was studded with the sparkling gems. The azure of space was deepened by contrast with the bright streams of light coming from the stars. To crown the glory of the picture, the silvery moon appeared above the horizon, cutting her way in queenly grandeur through the surrounding clouds.

(*b*) *Insensibly*—adv. of manner, mod. 'fell.'
*fell*—verb, intrans., irreg., *fall, fell, fallen*, indic., past indef., 3rd pers., sing., agr. with subj. 'night.'
*myself*—comp. pers. pron., reflect., 1st pers., sing., mas., obj., gov. by 'amused.'
*as*—subord. conj., temporal, connecting subord. sent. 'they faded away' with the principal sent. 'several stars.....another.'
*they*—demonstr. pers. pron., referring to 'colours,' 3rd pers., plur., neut., nom., subj. of 'faded.'
*faded*—reg. intrans. verb, indic., past indef., 3rd pers., plur., agr. with subj. 'they.'
*away*—adv. of manner, mod. 'faded.'
*heightened*—complete part. of reg. trans. verb 'heighten, attrib. to 'blueness,' and forming with 'was' a compound tense, pass. voice.
*that*—simple rel. pron., referring to 'rays,' 3rd pers., plur., neut., nom., subj. of 'passed.'
*passed*—reg. intrans. verb., indic., past indef., 3rd pers., plur., agr. with subj. 'that.'
*through*—prep., relating 'passed' and 'it,' the object.
*it*—demonstr. pers. pron., referring to 'ether,' 3rd pers., sing., neut., obj., gov. by 'through.'

(*c*)

| Sentence. | Kind. | Subject. | Predicate. | Extensions. | Connective. |
|---|---|---|---|---|---|
| (1) In proportion as they faded away. | Subord. adv. sent. to (3) | they | faded | away (manner) | In proportion as |
| (2) And (in proportion as they) went out. | Subord. adv. sent. to (3) | (they) | went out | | (in proportion as) |
| (3) Several stars and planets appeared one after another. | Principal | several stars and planets | appeared | one after another (manner) sents. (1) (2) and (4) | |
| (4) Until the whole firmament was in a glow. | Subord. adv. sent. to (3) | the whole firmament | was in a glow | | until |

(*d*)

| *Words with Latin terminations.* | *Additional examples.* |
|---|---|
| insensibly. | ostensibly. |
| variety, majesty. | liberty, amity. |
| colours. | honours, favours. |
| proportion. | extortion, contortion, potion. |
| firmament. | condiment, ointment. |
| luminaries. | aviary, library. |
| complete. | replete, effete. |

## Geography.

*Answer either Q. 2 or Q. 3; not both.*

1. Describe the productions of the different parts of British India, and draw a map to illustrate your answer. Insert the lines of latitude and longitude.

*See answer under Second Year.*

2. What are the prevailing winds of the Indian and Pacific Oceans? Show how the climate of the different parts of Australia is affected by winds.

The prevailing winds of the Indian Ocean are the *monsoons*, which are vital to navigation, and have a great effect on the climate of India. It is also exposed to sudden tempests or tornadoes. In the Pacific, winds, called *trade-winds*, blow during the entire year in a general direction from east to west; but, from various causes, are modified so as to become the permanent north-easterly and south-easterly currents forming the magnificent phenomenon of the 'Trades.'

In the northern half of Australia the seasons depend very much on the monsoons. Over the southern half the prevalent winds are westerly. The south-east corner has, on the whole, the best climate, owing to the Australian Alps intercepting the moisture-laden west wind, and hence the rainfall is great, and able to be depended on. Stifling hot winds are complained of on the coast, especially in South Australia.

3. Name the chief rivers which rise in Central Africa; trace the course of two of them, and name the travellers who have explored them.

The chief rivers which rise in Central Africa are the Nile, the Livingstone or Congo, and the Zambesi.

The Nile rises in L. Victoria Nyanza, first flows in a northerly direction for about 800 miles, when it unites with a large tributary from the W., named the Bahr-el-Ghazal; then, proceeding northwards, it meets on the right the Giraffe and Sobat, and then the Blue Nile or Bahr-el-Azrek, at Khartoom, in Nubia. Its only other tributary is the Atbara or Tacazze, from Abyssinia, which joins it on the right. The total direct course of the Nile is reckoned at 4,000 miles.

The explorers of the Nile have been Bruce, Burton, Speke, Grant, and Baker. Its head-waters have been explored by Stanley and Cameron.

The Livingstone or Congo, the chief explorers of which have been Livingstone, Cameron, and Stanley, rises in the mountains above Lake Nyassa, and falls into Lake Bangweolo, from which it issues under the name of the Luapula, and flows N. to L. Moero. From the north side of the lake issues the Lualaba, which Stanley proved to be the Congo. It is fed by numerous tributaries from the S., E., and N., the greatest being the Ikelembo, and falls into the Atlantic.

## SECOND PAPER.

*Two hours and a half allowed.*

### History.

1. Who were the Puritans? Mention their chief demands in the Hampton Court Conference?

The name of 'Puritan' was first applied in the reign of Queen Elizabeth to such clergymen of the Church of England as declined to subscribe to its liturgy, ceremonies, and discipline, according to the requirements of the bishops in their respective dioceses. The clergymen, so-called, desired a form of worship more simple and *pure* than they believed that of the then Established Church to be. They were called Puritans probably out of derision, and the name was shortly applied to the laity as well as the clergy.

Their chief demands may be given under these four heads:—(1) Purity of doctrine, (2) a learned ministry, (3) reconstruction of the Book of Common Prayer, (4) the reform of the ecclesiastical courts.

2. Who was George I.? Under what arrangement did he ascend the throne?

George I., who became king of England in 1714, was the great-grandson of James I. Elizabeth, daughter of James I., had married Frederick, the Elector Palatine, and their daughter Sophia was the mother of George I.

By the Act of Settlement (1701) it was arranged that the sovereigns of England should be Protestants in communion with the Church of England, and that the Electress Sophia of Hanover, and her heirs (if Protestants), should succeed to the crown of England.

George I. accordingly under this arrangement ascended the throne.

3. How was the Peninsular War brought about? Name the great British commander engaged in it, with his principal successes?

Napoleon, after crushing Portugal, turned against Spain, and sought to make his brother Joseph king of Spain. From this act of aggression sprang the Peninsular War which gave the first decided check to Napoleon's ambitious designs. The Spaniards rose, and asked aid from Britain. Sir Arthur Wellesly landed (1808) and defeated Junot at *Vimiero*. After a recall he again returned to the Peninsula, and won the battle of *Talavera* (1809), for which he was created Viscount Wellington.

In 1810 Wellington defeated Massena at *Busaco*. In 1811 he gained the battle of *Fuentes d'Onoro*; that of *Salamanca*, 1812; of *Vittoria*, 1813; *battles of the Pyrenees*, and *battle of Nivelle* in the same year. In 1814 Wellington, victorious to the end, defeated Soult at *Orthes*, and also at *Toulouse*, which was the last battle of the war.

### Teaching.

Sketch the notes of a lesson on *one* of these subjects:—

The use of adjectives.

A clock.

NOTES ON 'THE USE OF ADJECTIVES.'

Introduce subject by asking for the names of things that the children would like, and answers such as 'apple,' 'orange,' 'watch,' 'doll,' will be elicited. Then question them as to the kind of 'apple' they would like, and 'good,' 'large,' 'ripe,' etc., may be given. Proceed in the same way with 'orange,' and vary it with questions as to the *kind* they would *not* like, when they will probably give 'bad,' 'small,' 'unripe,' 'bitter.'

The nature of the adjective may be further shown by inquiring *how many* oranges, apples, dolls, etc., the children would like. One may answer 'two,' another 'six,' and so on. Advantage may be taken by the answer to show the different characters of the children who furnish the answer. One was a *modest* child, another *greedy*, etc. Now write the word 'Adjective' on the blackboard, and explain that those words which they have been putting to the names or nouns are adjectives, and so draw from them that the use of adjectives is 'to tell about the nouns as to what kind they are, how many there are of them, and which ones are meant.'

Write on the blackboard Adjectives of Quality:—*tall*, *good*, etc. Adjectives of Quantity:—*two*, *many*, *much*, etc. Adjectives of Distinction:—*this*, *yon*, *former*, etc. Exercise from reading-books.

A CLOCK.

Question the children as to when school begins, time for dinner, the hour for leaving school, and then as to what it is that gives us the information. After getting the answer 'clock,' questions will follow on the 'shape'; 'the face or dial'; 'the marks for hours'; 'hands to point the hours and minutes'; 'the lengths of the hands'; 'the marks for minutes'; 'the number of them'; 'why are there holes in the face?' 'what is the use of the key?' Question on the winding of the clock. (If possible, show the inside of the clock, and explain according to the capacity of the children the 'works,' the use of the 'pendulum' and the 'weights,' comparing them with the use of a 'spring' in a watch.) Clock strikes to warn us of the flight of time; time precious; lessons on the value of time, punctuality, etc.

### Euclid.

*Answer two questions, including Question* 1, *if possible.*

[All generally understood abbreviations for *words* may be used.]

1. If two circles cut each other, the line joining their points of intersection is bisected at right angles by the line joining their centres.

*See answer under Second Year.*

2. Straight lines which are parallel to the same straight line are parallel to each other.

Prop. 30, Bk. I.

3. To describe a parallelogram equal to a given rectilineal figure, and having an angle equal to a given rectilineal angle.

Prop. 45, Bk. I.

### Algebra.

MALES.

*Answer two questions.*

1. Prove that—

$$(x^2+yz)^2+(y^2+zx)^2+(z^2+xy)^2-(yz+zx+xy)^2=x^4+y^4+z^4.$$

(a) $(x^2+yz)^2=x^4+2x^2yz+y^2z^2$

(b) $+(y^2+zx)^2=\quad +y^4+2xy^2z+z^2x^2$

(c) $+(z^2+xy)^2=\quad\quad\quad +z^4+2xyz^2+x^2y^2$

(d) $-(yz+zx+xy)^2=-2x^2yz-y^2z^2\quad -2xyz^2-z^2x^2\quad -2xy^2z-x^2y^2$

By addition the above results $=x^4\quad\quad +y^4\quad\quad +z^4$

Q. E. D.

2. Simplify $\frac{a}{c} - \frac{(ad-bc)x}{c(c+dx)} - \frac{a}{c+dx}$

$$\frac{a}{c} - \frac{(ad-bc)x}{c(c+dx)} - \frac{a}{c+dx} =$$

$[c(c+dx)$ = L. C. D.]

$$\frac{a(c+dx)-(ad-bc)x-ac}{c(c+dx)} =$$

$$\frac{ac+adx-adx+bcx-ac}{c(c+dx)} =$$

$$\frac{bx}{c+dx}$$ Ans.

3. Solve the equations :—

(1) $\frac{3}{28}(8x+3) - \frac{1}{14}(7x-13) - \frac{1}{21}(47x-167) = 0.$

(2) $\frac{x-\frac{1}{a}}{c} + \frac{x-\frac{1}{b}}{a} + \frac{x-\frac{1}{c}}{b} = 0.$

(1) $\frac{3}{28}(8x+3) - \frac{1}{14}(7x-13) - \frac{1}{21}(47x-167) = 0$

Clearing of fractions $24(8x+3) - 49(7x-13) - 5(47x-167) = 0$

Clearing brackets $192x + 72 - 343x + 637 - 235x + 835 = 0$

Transposing $192x - 343x - 235x = -835 - 637 - 72$

Collecting and changing signs $386x = 1544$

$x = 4.$ Ans.

(2) $\frac{x-\frac{1}{a}}{c} + \frac{x-\frac{1}{b}}{a} + \frac{x-\frac{1}{c}}{b} = 0$

$\frac{ax-1}{ac} + \frac{bx-1}{ab} + \frac{cx-1}{bc} = 0$

$abx - b + bcx - c + acx - a = 0$

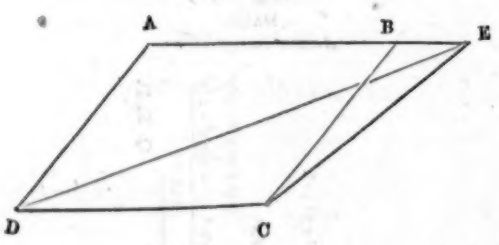
$abx + bcx + acx = a + b + c$

$x(ab+bc+ac) = a + b + c$

$x = \frac{a+b+c}{ab+bc+ac}$ Ans.

## Mensuration.

ABCD is a parallelogram whose base DC is 16 yards 2 feet 3 inches, and height 14 yards 2 feet 8 inches ; AB is produced to any point E. Find the area of the triangle DCE.




By Prop. 41, Bk. I., the triangle

DCE = ½ parallelogram ABCD.

Area of ABCD = 16 yds. 2 ft. 3 in. × 14 yds. 2 ft. 8 in.

" = 603 in. × 536 in.

" = 323208 sq. in.

∴ Area of DCE = ½ of 323208 "

" = 161604 "

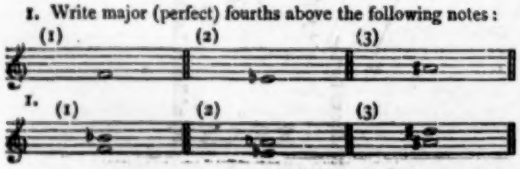
" = 1122 sq. ft. 36 sq. in.

= 124 sq. yds. 6 sq. ft. 36 sq. in. Ans.

## Music.

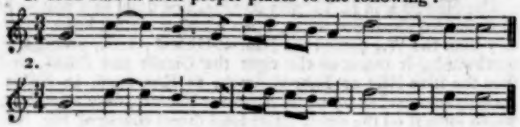
*A quarter of an hour allowed for this paper.*

1. Write major (perfect) fourths above the following notes :




1. (1) *fah* to *ta*.
(2) *me* to *lah*.
(3) *fe* to *te*.

2. Add bars in their proper places to the following :—



2.



3. Give (briefly) the meanings of the following terms :— (1) *Adagio*. (2) *Crescendo*. (3) *Dolce*.

3. (1) Leisurely. (2) Increasing (in loudness). (3) Soft.

## TONIC SOL-FA NOTATION.

1. Write major (perfect) fourths above the following :

(1) *fah*.
(2) *me*.
(3) *fe*.

1. (1) *fah* to *ta*.
(2) *me* to *lah*.
(3) *fe* to *te*.

2. Re-write the following, doubling the value of every note. Use four-pulse measure.

|d' :s .f |m :s .,l |s .t, :d ‖

2. |d' :— |s :f |m :— |s :-.l |s :t, |d :—‖

3. What do the following terms mean : (1) *Allegro*. (2) *Staccato*. (3) *Diminuendo* ?

3. (1) Merry, lively. (2) Cut off. (3) Decreasing in speed and (generally) in intensity.

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# FOURTH YEAR.

**Pupil Teachers at end of Fourth Year,** *if apprenticed on, or after,* **1st May, 1878 ; and Pupil Teachers at end of Fifth Year,** *if apprenticed before that date.*

*Three hours and a half allowed.*

## Arithmetic.

MALES.

1. A dealer by selling a horse for £32 loses 4 per cent.; what would he have gained by selling it for £40?

Here £32 bring 96 parts of a hundred ; the question is, how many parts will £40 bring?

∴ £32 : £40 :: 96 : the No. of hundredths

$\frac{96 \times 40}{32} = 120$, *i.e.*, a gain of 20 p. c. Ans.

2. A man has £3060 worth of stock in the 3 per cents. and sells out 102½, and then re-invests the proceeds in 4 per cent. debentures at 127½. Find the increase in his income, the usual brokerage being charged on each transaction.

127½ : 102½ :: £3060 : stock in 4 p. c. debentures

2 2

255 205

$$\frac{£3060 \times 205}{255} = £2460$$

| | £ | s. |
|---|---|---|
| 2nd income $= \frac{£2460 \times 4}{100}$ | = 98 | 8 |
| 1st " $= \frac{£3060 \times 3}{100}$ | = 91 | 16 |
| Difference of income = | 6 12. | Ans. |

3. A tradesman sells ⅓ of his stock at a gain of 20 per cent., ⅓ at a gain of 12 per cent., and the remainder at a loss of 10 per cent. Find the average gain per cent. on the whole.

Suppose his stock to have valued £120.

| | £ | £ | s. |
|---|---|---|---|
| 1. 20 p. c. gained on ⅓ of 120 = $\frac{120}{100}$ of 60 = | 72 | | 0 |
| 2. 12 p. c. " ⅓ of 120 = $\frac{112}{100}$ of 40 = | 44 | | 16 |
| 3. 10 p. c. lost on 20 = $\frac{90}{100}$ of 20 = | 18 | | 0 |
| Total return for £120 = | 134 | | 16 |
| " gain on " = | 14 | | 16 |

∴ 120 : 100 :: £14 16s. : average gain p. c.

$$\frac{£14\ 16s. \times 100}{120} = \underline{12\tfrac{1}{2}\text{p. c.}}\ \text{Ans.}$$

4. A and B can do a piece of work in 6 days, A and C in eight days, and A, B, and C in $4\frac{1}{2}$ days. In what time would each do the work separately?

A + B do $\frac{1}{6}$ in 1 day = $\frac{1}{6}$
A + C ,, $\frac{1}{8}$ ,, = $\frac{1}{8}$
A + B + C ,, $\frac{2}{9}$ ,, = $\frac{2}{9}$

∴ C does $\frac{2}{9} - \frac{1}{6} = \frac{1}{18}$ in 1 day; and the whole in 18 days. Ans.
B ,, $\frac{2}{9} - \frac{1}{8} = \frac{7}{72}$ ,, ,, ,, ,, $10\frac{2}{7}$ ,, Ans.
A ,, $\frac{1}{6} - \frac{7}{72} = \frac{5}{72}$ ,, ,, ,, ,, $14\frac{4}{5}$ ,, Ans.

5. A hundred coins, consisting of half-crowns and florins, are worth £11 8s.; find the number of half-crowns and florins.

Suppose the hundred coins to have been 50 half-crs. and 50 fls.

| | s. |
|---|---|
| Then 50 half-crs. = | 125 |
| And 50 florins = | 100 |
| Total = | 225 |
| But the real number = | 228 |
| Difference = | 3s. too little. |

Now 3s. equals the excess of 6 half-crowns over 6 florins
∴ the number of half-crowns = 56. Ans.
and ,, florins = 44. Ans.

FEMALES.

1. In what time will the interest on £450 amount to £72 at 4 per cent.?

450 : 100
4 : 72 } :: 1 yr. : time

$$\frac{1\text{ yr.} \times 100 \times 72}{450 \times 4} = \underline{4\text{ yrs.}}\ \text{Ans.}$$

2. Find the present worth and discount of £4492 2s. 6d., due at the end of $3\frac{1}{2}$ years, at 6 per cent.

| | £ |
|---|---|
| Interest of £100 for $3\frac{1}{2}$ yrs. at 6 p. c. = | 21 |
| Amount ,, ,, ,, = | 121 |

∴ 121 : 100 :: £4492 2s. 6d. : present value.

$$\frac{£4492\ 2s.\ 6d. \times 100}{121} = \underline{£3712\ 10s.}\ \text{pres. value. Ans.}$$

∴ discount = £4492 2s. 6d. − £3712 10s. = £779 12s. 6d. Ans.

3. If a ton of ore in a gold mine yields 5 oz. troy of gold, what is the yield per cent.?

1 ton avoir. = 2240 lb. × 7000 = 15,680,000 grs. troy.
5 oz. troy = 2400 ,,
∴ 15,680,000 : 100 :: 2400 :: yield per cent.

$$\frac{2400 \times 100}{15{,}680{,}000} = \frac{1}{6533\frac{1}{3}} = \underline{\tfrac{1}{13}\text{ p. c.}}\ \text{Ans.}$$

4. What amount of stock at $84\frac{1}{2}$ may be bought for £1878 13s. 6d., brokerage to be paid $\frac{1}{2}$ per cent.?

Price of £100 = $84\frac{1}{2} + \frac{1}{2} = 84\frac{1}{2}$.
∴ $84\frac{1}{2}$ : 100 :: £1878 13s. 6d. : stock
8 8
677 800

$$\frac{£1878{\cdot}675 \times 800}{677} = \frac{1502940}{677} = \underline{£2220.}\ \text{Ans.}$$

## English Grammar and Composition.

1. Make three complex sentences, each containing an adverbial sentence; and three others, each containing an adjective sentence.

(*a*) 1. He went *where the lions were kept.*
2. He died *as he had lived.*
3. *The higher he climbs* the more heavily he will fall.

(*b*) 1. They stood on a hill *that overlooked the moor.*
2. We visited the house *where the lions are kept.*
3. Saturday is the day on *which the examination is held.*

2. 'It is the common doom of man that he must eat his bread by the sweat of his brow, that is, by the sweat of his body or the sweat of his mind. If this toil was inflicted as a curse, it is attempered with many alleviations, many comforts. I cannot call a healthy young man, cheerful in his mind, and vigorous in his arms, I cannot call such a man poor; I cannot pity my kind, as kind, merely because they are men. This affected pity only tends to dissatisfy them with their condition, and to teach them to seek resources, where no resources are to be found, in something else than their own industry, frugality, and sobriety.'

BURKE.

(*a*) Say in a brief summary what this passage means.

(*b*) Choose from the passage twelve words which you know to be derived from Latin. Trace their origin and give their exact modern meaning.

(*a*) Though man has been doomed to earn a livelihood either by manual or mental labour, yet this doom has been lightened by many blessings. So long as a young man is healthy and strong, he has no need of our pity or assistance, for he ought to be taught to see that honest work, no matter how lowly, is noble work, and that his dependence for success ought to lie in his own strong arm.

(*b*)

| WORDS OF LATIN ORIGIN. | DERIVATION. | MODERN MEANING. |
|---|---|---|
| Common | communis | alike to all. |
| Inflicted | inflictus (infligo) | laid upon (as a punishment) |
| Attempered | ad tempero | moderated |
| Alleviations | ad levatus | what lightens or eases an evil |
| Vigorous | vigor (vigeo) | strong with an idea of youth |
| Affected | ad facio | assumed, feigned |
| Tends | tend (to stretch) | has an influence |
| Dissatisfy | dis, satis, facio | to make one discontented |
| Condition | conditio | state in which placed |
| Resources | re-surgo (Fr.) | something to use in emergencies |
| Industry | industria | steady application to work |
| Frugality | frugi, frugalior | economy, saving |
| Sobriety | sobrius, sobrietas | temperance |

3. What examples occur in this passage of passive verbs? Say what is meant by a passive verb, and give other examples.

The passive verbs are: 'was inflicted,' 'is attempered,' 'are to be found.' By a passive verb is meant that form of a transitive verb in which the object of the active voice becomes the subject, as: 'The man struck the dog' (active); 'the dog was struck' (passive); 'God doomed man to labour' (active); 'man was doomed to labour' (passive). Intransitive verbs have no passive, because they have no object.

4. Name three of the greatest English writers, and give the names of their principal works.

Three of the greatest writers were Shakespere, Milton, and Carlyle:—

Shakespere's principal works are the dramatic plays of 'Hamlet,' 'Macbeth,' 'King Lear,' 'Romeo and Juliet,' 'Othello,' 'Midsummer Night's Dream,' 'As You Like It,' 'Merchant of Venice,' 'Richard III.,' 'Coriolanus,' and 'Julius Cæsar.'

Milton wrote 'Paradise Lost,' 'Paradise Regained,' 'Samson Agonistes,' and the 'Areopagitica.'

Carlyle's chief works are: 'French Revolution,' 'Sartor Resartus,' 'Frederick the Great,' 'Life of John Sterling,' 'The Letters and Speeches of Oliver Cromwell.'

## Geography.

1. Give notes of a lesson on tides, with illustrations from different parts of the world.

WHAT THE TIDES ARE.—Tides are the rise or swell formed in the water of the sea, and appearing as currents along shores.

HOW TIDES ARE CAUSED.—They are produced by the attraction of the sun and moon, but principally by the influence of the moon. The moon attracts all things on earth; pulls them towards it; and water, being fluid, changes its shape as it is pulled, and rises up towards the moon in a large heap. As the earth is spinning round all the time, the water is carried on and will not rise quite in the same shape that it would if it were at rest, but gets spread out into a broad flat wave. This tidal-wave goes travelling along over the surface of the sea following the moon, and always two or three hours behind it; and as it comes to the various places along the coast, it forms the high tide there. The moon raises a similar heap of water on the opposite side of the world at the same time, so that there are always two tidal-waves going round at once, each half a day apart. The sun also attracts

the water, though, from being so far off, much less than the moon does. When the two come in line, and pull together—that is at new and full moon—the tides are highest, and called *spring* tides; when they are at right angles to one another—that is at the moon's quarters—the tides are lowest, and called *neap* tides.

EXAMPLES.—The foregoing is the general principle of the tides, but it is very much interfered with by the form of the coast, the depth of the sea, the friction of the water on itself and on the shore, the action of the wind, the ocean currents, and many other things. The original height of the tide-wave—the heap raised by the moon—is from 3 to 4 feet, which is the rise of the tide in the Pacific; but where there is a bay or inlet, with high steep walls, the water will force its way in, and rise much higher. In the Bristol Channel the tides are forced up as high as 30, and even 50 feet; and in the Bay of Fundy, to 70, 80, and even 100. On the coast of Jutland, in the German Ocean, owing to the tide-wave from the north meeting that from the south round Great Britain, there is little or no variation, but perpetual high water.

COURSE OF THE TIDAL SWELL.—In the Southern Ocean, because it is the most open of all, the tidal swell travels at the rate of 1,000 miles an hour, reaching Cape Blanco, in Africa, and Newfoundland at the same time. Six hours later it reaches the western shores of the British Islands, splitting into two divisions, of which the northern reaches Norway, Denmark, and Aberdeen about the same time, while the southern division brings high water to the southern shore of England, and the coast of France.

2. Describe fully the physical features, chief towns, inhabitants, and governments of Brazil, Zanzibar, Madagascar, and Japan. Draw little sketch-maps in illustration of your answer. Insert the lines of latitude and longitude.

*Brazil.*—Its surface is mountainous in the E. and S., level in the N. and W.; the former, an immense plateau, extending 2,000 miles inland; the latter consisting chiefly of the rich forest plains of the Amazon, and its gigantic system of affluents.

The chief towns are Rio de Janeiro, with a fine harbour, and great commerce; Bahia, a beautiful town, with good trade; Pernambuco, third seaport of Brazil; Villa Rica, or Ouro Preto, capital of the richest mining province; Cuyaba, famous for diamonds; and Matto Grosso, which exports gold and diamonds.

Brazil is a hereditary constitutional monarchy or empire; for the sovereign is styled emperor, with a Senate and House of Representatives. The inhabitants consists of wild Indians, estimated at about two millions, mulattoes, free negroes, and whites of Portuguese extraction.

*Zanzibar.*—It is also called Zanguebar, and consists of a maritime strip stretching northwards from the mouth of the Rovuma to the Juba. It includes the island of Zanzibar, on which is the town of Zanzibar, the capital. Quiloa, Bagamoyo, and Mombas are the other principal places under the Sultan. From Bagamoyo, on the mainland opposite the I. of Zanzibar, the expeditions of Livingstone, Stanley, Cameron, and other travellers started for the exploration of the Lake Region. The country is subject to an Arabic sultan, who pays tribute to the Imaum of Muscat, and the inhabitants, Suaheli, now contain so great an admixture of Arab blood in their veins that they are called Arabs.

The surface along the coast is low, flat, and sometimes marshy, with rank vegetation, and this plain extends to a considerable distance inland, bounded by arid heights running parallel to the coast.

*Madagascar.*—The interior is traversed by a chain of lofty mountains, covered with valuable trees, and the fertile plains along the coast are watered by numerous streams.

Antananirivo, the capital, is situated on a lofty plateau in the centre of the island; Tamatave, the chief commercial town, is on the N.E. coast.

The government is a monarchical despotism, but the authority of the supreme ruler becomes weaker the further one goes from the capital. The Hovas are the ruling tribe, who have sway over most of the island. The inhabitants, who are named Malagasy, appear to form substantially a single race, though they have received a certain amount of Arab intermixture.

*Japan.*—The Japanese islands are intersected by chains of mountains, several of which are volcanic, and some so lofty as to be covered with perpetual snow; the majority of the hills, however, are cultivated to the summit.

The chief towns are Yeddo, or Tokio, capital of the empire, one of its streets is ten miles long; Orogawa, the port of Yeddo; Miako, the ecclesiastical capital; Yokohama, the station of the British fleet; Nagasaki, the principal seaport; Matsmai, a large commercial city; Hakodadi, one of the first towns open to foreigners. Until 1869 there were two sovereigns, the Mikado, or spiritual emperor, and the Tycoon, or temporal sovereign; but as the result of a civil war, the sole supreme power is vested in the Mikado, who acts through an executive ministry, organised on a basis that is partly European.

The Japanese are considered to be of the Mongolian race, with some admixture of Malay blood. They have of late made rapid progress towards the advanced civilization of Europe and America.

## SECOND PAPER.

*Two hours and a half allowed.*

### History.

1. Trace the descent of Queen Victoria from James I., with the consorts of the persons named, and their nationalities.

James I., m. Anne of Denmark.
|
Elizabeth, m. Frederick, Elector Palatine (German).
|
Sophia, m. Ernest Augustus (Hanoverian).
|
George I., m. Sophia of Zell (German).
|
George II., m. Caroline of Anspach (German).
|
Frederick, m. Augusta of Saxe-Gotha (German).
|
George III., m. Charlotte of Mecklenburg-Strelitz (German).
|
Edward, Duke of Kent, m. Victoria of Saxe-Coburg (German).
|
Victoria, m. Prince Alfred of Saxe-Coburg and Gotha (German).

2. What was the Long Parliament? Trace its history, and show how far it was friendly or hostile to freedom.

The Long Parliament was the fifth and last called by Charles I., 1640. When it met, this Parliament set itself to reform the abuses in the Government, and to punish those servants of the king who had helped him to oppress the country. The Earl of Strafford was declared a traitor and executed; Laud was cast into prison; ship-money and all the arbitrary exactions of the king abolished; the Star Chamber and Court of High Commission were done away with, and a Bill was passed which declared that Parliament should not be dissolved, prorogued, or adjourned without the consent of the members themselves. So far the Commons had obtained such concessions from the Crown as fixed the Constitution nearly upon the same equal principles on which it stands at the present day; so far they had acted the part of patriots and friends to their country; but from this period their designs cannot be reduced to the same laudable principles. This Bill had, by rendering Parliament perpetual, virtually annihilated the English Constitution by destroying that just equilibrium upon which its existence depends, and the consequence of that step was the total extinction of monarchical government.

A grand remonstrance was presented to the king, 1642, and by an attempted arrest of five members he roused the anger of the people so much that he fled, never to return till his trial and execution. Then followed the assumption on the part of Parliament of the whole legislative and executive authority of government, and the Civil War began. In 1642 it opened at Edgehill, and ended at Naseby, 1645. Charles gave himself up to the Scots at Newark, 1646, was transferred to Parliament, and finally brought to trial and executed, 1649. On the death of Charles, the Commons abolished the House of Lords, but they were themselves expelled by Cromwell in 1653. The surviving members of this famous Parliament were recalled by Monk, 1660, and after voting their own dissolution, separated never to meet again.

3. To what events would you attribute the Peace of Amiens (1802) and of Paris (1814)?

The Peace of Amiens may be attributed to the surrender of Malta, by which the English gained the mastery of the Mediterranean, to Abercromby's forcing the French to evacuate Egypt, and to Nelson's capturing the bulk of the Danish fleet. On the English side there was a general sense that the struggle with the Revolution was at an end, from the fact that the war had at last seated on the throne of France a military despot who hated the principles of that Revolution even more than England did.

The Peace of Paris was due to the splendid achievements of Wellington in the Peninsula from 1808 till 1813, to the ignominious failure of Napoleon in Russia (1812), to the disastrous overthrow of his army at Leipzig (1813), and to the surrender of Paris to the allied host of Russians, Prussians, and Austrians, 1814.

## Teaching.

Give a sketch of a first lesson to children on *Reduction of money.*

Having seated the children in front of a blackboard with their slates and pencils ready for work, they should be practised in the mental reduction of pounds to shillings, shillings to pence, pence to halfpence or farthings. If they have been taught the compound rules of addition and subtraction they will have some idea of the relational value of the different denominations. Reducing from a higher to a lower denomination, being easier than the reverse order, it will be better to begin with it. After showing that for every pound there must be 20 shillings, shillings to pence, pence to halfpence or farthings. If they have been taught the compound rules of addition and subtraction they will have some idea of the relational value of the different denominations. Reducing from a higher to a lower denomination, being easier than the reverse order, it will be better to begin with it. After showing that for every pound there must be 20 shillings, show that £3 17s. will be 20 times 3 and 17s. more; do the same with other examples, and follow up with explaining in a similar way that the reduction of 6s. 3d. to pence is 12 times 6 and 3d. more; of 2¾d. to farthings, 4 times 2 and 3 more. Then work out in full on the board such an example as £4 7s. 6¾d. to farthings, explaining clearly every step in the process, and writing after each line its name: shillings, pence, or farthings. Finish the lesson by giving an easy example to be worked on slates to test how far they have been able to follow your teaching.

## Euclid.

MALES.

[All generally understood abbreviations for *words* may be used.]

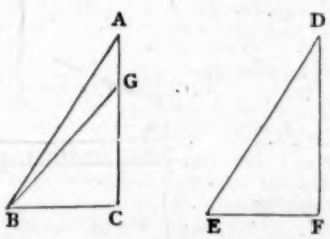
*Answer two Questions, including Question* 1, *if possible.*

1. Two right-angled triangles have their hypotenuses equal, and a side of one equal to a side of the other; show that they are equal in all respects.

(Do not use propositions after the twenty-sixth of the First Book.)

If AB = DE and BC = EF in the two triangles ACB, DFE, right-angled at C and F, then the two triangles are equal in every respect.

First, AC shall be equal to DF; for if not one of them must be the greater, let AC be the greater, and from AC cut off a part CG = FD, and join BG.




Then in the triangles BGC, EDF (I. 4) BG = ED, but ED = BA, ∴ BG = BA, and ∴ ∠ BGA = ∠ BAC; but ∠ BGA is greater than ∠ BCA (I. 16), ∴ ∠ BAC is greater than ∠ BCA, that is two angles in one triangle greater than two right angles, which is impossible (I. 17). Wherefore AC is not greater than DF, and in the same manner it may be shown that it cannot be less, it must, therefore, be equal to it, and hence (I. 4) the triangles ABC, DFE are equal in all respects. Q. E. D.

2. If a straight line be divided into any two parts, the rectangles contained by the whole and each of the parts are together equal to the square on the whole line.

Prop. 1, Bk. II.

3. To describe a square that shall be equal to a given rectilineal figure.

Prop. 14, Bk. II.

## Algebra.

MALES.

*Answer two Questions*

1. Two fractions are together equal to $\frac{a}{b}$, and the one exceeds the other by $\frac{c}{d}$; find them.

Let $x$ = the value of the greater,
and $y$ = ,, ,, less.

$\therefore$ (1) $x+y=\frac{a}{b}$

(2) $x-y=\frac{c}{d}$

Adding $2x = \frac{a}{b}+\frac{c}{d}$

$x = \frac{1}{2}\left(\frac{a}{b}+\frac{c}{d}\right)$ greater. Ans.

By subtracting (2) from (1) $2y = \frac{a}{b}-\frac{c}{d}$

$y = \frac{1}{2}\left(\frac{a}{b}-\frac{c}{d}\right)$ less. Ans.

2. Reduce to lowest terms:—

$$\frac{ac+bd+ad+bc}{af+2bx+2ax+bf}$$

$$\frac{ac+bd+ad+bc}{af+2bx+2ax+bf} = \frac{(ac+bc)+(ad+bd)}{(af+bf)+(2ax+2bx)}$$

$$= \frac{c(a+b)+d(a+b)}{f(a+b)+2x(a+b)}$$

$$= \frac{c+d}{f+2x}. \text{ Ans.}$$

3. Solve the equations:—

(1) $221x-248y=5$
$247x-277y=7$

(2) $\frac{x}{4}-\frac{3x-2}{11x}+\frac{2(1-x)}{x}=0.$

$221x-248y=5$, or $4199x-4712y=95$ (multiplying by 19)
$247x-277y=7$, or $4199x-4709y=119$ ( ,, ,, 17)

$3y = 24$

$y = 8.$ Ans.

Hence $x = 9.$ Ans.

(2) $\frac{x}{4}-\frac{3x-2}{11x}+\frac{2(1-x)}{x}=0$

Clearing fractions $11x^2-12x+8+88-88x=0$

Collecting $11x^2-100x=-96$

Dividing by co-ef. of $x^2$ $x^2-\frac{100x}{11}=-\frac{96}{11}$

Completing square $x^2-\frac{100x}{11}+(\frac{50}{11})^2=(\frac{50}{11})^2-\frac{96}{11}$

$$=\frac{2500-1056}{121}=\frac{1444}{121}$$

Taking root $x-\frac{50}{11}=\pm\frac{38}{11}$

$x=\frac{50\pm38}{11}=\frac{8}{1}$ or $\frac{12}{11}$. Ans.

## Mensuration.

MALES.

*Answer one Question.*

1. Two straight roads cross at right angles; two men start at the same time from the point where the roads meet, one man walking along one road at the rate of 4 miles an hour, and the other man walking along the other road at the rate of 3 miles an hour. How far apart will the men be in ten minutes after starting?

The one will have gone in 10 minutes ⅙ of 4 miles, or ⅔ mile,
,, other ,, ,, ,, ⅙ of 3 ,, ½ ,,
Now we have two sides of a right-angled triangle, ⅔ mile and ½ mile respectively, and it is required to find the hypotenuse.

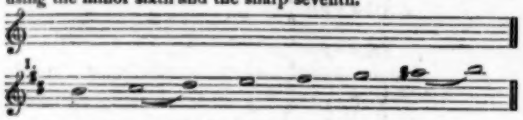
$\therefore (\frac{2}{3})^2+(\frac{1}{2})^2=(\text{distance})^2$

$\therefore$ Distance required $= \sqrt{(\frac{3}{4})^2 + (\frac{1}{4})^2}$ mile
$= \sqrt{\frac{9}{16} + \frac{1}{16}}$ ,,
$= \sqrt{\frac{10}{16} + \frac{2}{16}}$ ,,
$= \sqrt{\frac{12}{16}}$ ,,
$= \frac{1}{2}$ mile. Ans.

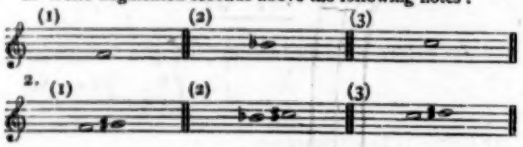
### Music.

*A quarter of an hour allowed for this paper.*

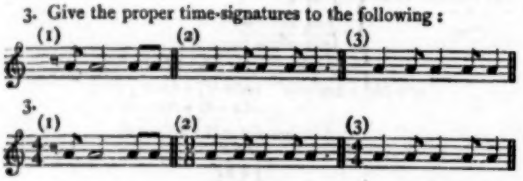
1. Write in the treble clef the ascending scale of B minor, using the minor sixth and the sharp seventh.



2. Write augmented seconds above the following notes:




3. Give the proper time-signatures to the following:




### TONIC SOL-FA NOTATION.

1. Write the ascending minor scale from *lah*$_1$ to *lah*, using the minor sixth and the sharpened seventh.

1. *lah*$_1$ *te*$_1$ *doh ray me fah se lah*

2. Write augmented seconds above the following notes:

(1) *fah.*
(2) *ta.*
(3) *doh*$^1$.

2. (1) *fah* to *se.*
(2) *ta* to *de.*
(3) *doh*$^1$ to *re*$^1$.

3. Re-write the following, halving the value of every note. Use two-pulse measure.

‖ s :s.l | s :-.f | n :s | s.f :n ‖

3. ‖ s .s,l :s .,f | n .s :s,f .n ‖

## Hygiene.

THE Science and Art Department have added Hygiene to their list, and 'direct that payments shall be made on the results of the examination in this subject, of such candidates only as have at the same, or at a previous examination, passed in the Elementary Stage of Animal Physiology.' The syllabus of this new subject includes:—(1) Food, Diet, and Cooking; (2) Water and Beverages; (3) Air; (4) Removal of Waste and Impurities; (5) Shelter and Warming; (6) Local conditions; (7) Personal Hygiene; (8) Treatment of Slight Wounds and Accidents. The Advanced Stage is given under these heads:—(1) Food and Adulterations; (2) Water and Beverages; (3) Examination of Air, Chemical and Microscopical; (4) Removal of Waste and Impurities; (5) Shelter and Warming; (6) Local conditions; (7) Personal Hygiene; (8) Prevention of Disease. To these topics aspirants after honours must add Trades' Nuisances, Vital Statistics, and Sanitary Law.

The spread of a scientific knowledge of this subject which 'their Lordships are pleased to sanction' must be in every way a benefit to the nation, and every teacher should acquire such an acquaintance with it as will enable him to expound its principles in occasional, if not in systematic, lessons to his pupils. *Mens sana in corpore sano.*

A detailed syllabus is given in Science Form, No. 1187, and may be had on application to the Secretary, Science and Art Department, South Kensington.

## Publications Received.

**Blackie and Son—**
Shakspere's 'Julius Cæsar,' with Notes.

**Burns and Oates—**
The Shakspere Reader. 'Richard II.'
The Standard Reading-Book. No. 6.

**Chambers (W. and R.)—**
English Composition. Short Themes. By A. Park, F.R.G.S.
English Composition Test Cards. For Standards VI. and VII. By A. Park, F.R.G.S.

**Griffith and Farran—**
The Attendance Token.
Our Little Ones.

**Heywood (John)—**
Wykes' New Graded Arithmetical Test Cards. Standards I. to VII.
Primers I. and II. 'Paragon Readers.'
Health Lectures for the People. No. 8. 'Cookery for the Household.'
Geometry and Mensuration for Schools. By W. J. Browne, M.A., London.
Half-Time Register. By J. H. Dee.

**Isbister (Wm., Limited)—**
First, Second, and Third Reader. London School Series.

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# Query Column.

## RULES.

1. Each correspondent is restricted to *one question.* We should be much obliged if correspondents, who send questions for solution, would give (if possible) the required answer, and the source from which the question is obtained.

2. No query can be answered unless accompanied by the real name and address of the sender, not necessarily for publication, but as a guarantee of good faith and for facility of reference.

3. ☞ **When a pseudonym is adopted it should be written at the end of the query, and the real name and address on a separate piece of paper.**

4. Correspondents are requested to write their queries *legibly*, and on one side of the paper only.

5. Replies will not be sent through the post.

6. Queries must reach the office *not later than the 12th of the month*, or they cannot be attended to in the following issue.

*** All communications for this column should be addressed—'*The Query Editor*,' *The Practical Teacher, Pilgrim Street, Ludgate Hill, London, E.C.*

### Arithmetic.

1. TEACHER.—A person has £50,000 stock in the 4 per cents. at 90; what stock must he have in the 4½ per cents. at 95 to produce an income of £9992?

Income from 1st stock = (500 × 4)£
= £2000;
∴ ,, ,, 2nd ,, = £9992 − £2000
= £7992;
∴ Amount of 2nd ,, $= \left(7992 \times \frac{100}{4\frac{1}{2}}\right)$£
$= \frac{7992 \times 200}{9}$£
= £177,600. Ans.

*Note.—Mrs. Fawcett's* 'Political Economy.' Published by *Macmillan & Co.* Price 12s.

2. SIGMA.—A sum of £1209 was invested in the 3½ per cents. at 92½; at what price must the stock be sold in order to gain £78, reckoning brokerage at ⅛ per cent.?

Quantity of stock bought = $(1209 \times \frac{100}{92\frac{1}{2}})$£
= £1300;
Price of stock (with brokerage) when sold to gain £78
= $\frac{1}{1300}$(1209 + 78) ÷ 13$\frac{1}{8}$£
= (1287 ÷ 13)£
= £99;
∴ Price of stock must be £(99 − ⅛)
= £98⅞. Ans.

3. RALPHO.—If A is 80 more than B, and B is 100 more than C, while C is 60 less than D, and D is half of A, how much do B and C amount to? (*Mansford.*)

A is 80 more than B,
B is 100 ,, ,, C,
∴ A is 180 ,, ,, C;
C is 60 less ,, D,
∴ A is 120 more ,, D;
But D is half of A,
∴ D is 120, and A is 240;
B is 80 less than A,
∴ B is 160;
C is 100 less than B,
∴ C is 60;
∴ B and C = 160 + 60
= 240. Ans.

*Note.*—Your writing is free, but it is rather indistinct. Each correspondent is restricted to *one* question.

4. SOLICITOR.—A person, having to pay a debt of £1085 at the end of two years, invested a certain sum of money in the 3 per cent. consols, allowing the dividends to accumulate until the payment of the debt, and also an equal sum the next year; supposing the investments to be made and the debt to be paid when consols are at 73, what must be the sum invested on each occasion, that there may be just sufficient to pay the debt at the proper time? (*Brooke Smith.*)

(By Method of Unity.)

Amount realised by an investment of £73 on each occasion
= £{(73 × 2) + (3 × 3)}
= £(146 + 9)
= £155;
Amount invested on each occasion to realize £155 = £73,
,, ,, ,, ,, ,, £1 = £$\frac{73}{155}$,
,, ,, ,, ,, ,, £1085
$= £\frac{73 \times 1085}{155}$
= £511. Ans.

5. CEDRIC.—A person has a number of oranges to dispose of; he sells half of what he has and one more to one person; half of the remainder and one more to a second person; half of the remainder and one more to a third person; and half of the remainder and one more to a fourth person; by which time he has disposed of all that he had. How many had he at first? (*Hiley.*)

No. before selling to fourth person = 1 × 2
= 2;
,, ,, third ,, = (2 + 1) × 2
= 6;
,, ,, second ,, = (6 + 1) × 2
= 14;
,, ,, first ,, = (14 + 1) × 2
= 30. Ans.

6. REX.—If money invested in the 3 per cent. consols give exactly 3 per cent. after paying 5d. in the pound income-tax, what is the price of the consols? (*Cambridge Local, Senior,* 1882.)

s. d. £ £
19 7 : 3 :: 1 : Percentage with income-tax.
12 240
247 | 7140
47 | 144
£3$\frac{47}{144}$
£ £ £
∴ 3$\frac{47}{144}$ : 3 :: 100 : Price of consols.
25
$= \frac{3 \times 3600 \times 47}{144 \times 12}$£ = £97$\frac{11}{12}$. Ans.

7. VIGILANS.—Egyptian 7 per cents. being at 40, in how many years' time might the debt be repudiated without loss to an investor reclaiming only simple interest, and considering the interests on safe investments to be 4 per cent. (*Oxford and Cambridge School Examinations, July,* 1876.)

Annual dividend = £7;
Annual interest on £40 at 4 per cent. = £1 12s.;
Annual difference = £7 − £1 12s.
= £5 8s.
£ s. £ year
∴ 5 8 : 40 :: 1 : Time
5 5
27 | 200
7$\frac{11}{27}$ years. Ans.

8. J. BATEY.—A cistern has two pipes, by one of which it may be filled in 40 minutes, and by the other in 50 minutes; it has also a discharging pipe by which it may be emptied in 25 minutes. If all these three were open together, in what time would the cistern be filled?

First pipe can fill the cistern in 40 min.,
Second ,, ,, ,, 50 ,, ,
Third ,, empty ,, 25 ,, ;
First ,, fill in 1 min. $\frac{1}{40}$ of the cistern,
Second ,, ,, ,, ,, $\frac{1}{50}$ ,, ,, ,
Third ,, empty ,, ,, $\frac{1}{25}$ ,, ,, ;

∴ Part filled in 1 min. when all are open $= \frac{1}{40} + \frac{1}{50} - \frac{1}{25}$

$$= \frac{5+4-8}{200}$$

$$= \frac{1}{200},$$

∴ When all are open the cistern will be filled in 200 min.

$= \underline{3 \text{ hrs. } 20 \text{ min.}}$ Ans.

9. KATHIE.—A soft-water cistern $\frac{3}{4}$ths full sprung a leak at the commencement of a shower; during the shower $\frac{1}{6}$ths of the water in it at the commencement ran out, but rain came in, which would have filled $\frac{1}{3}$rd of the cistern. How far was the cistern from being full at the end of the shower?

Quantity in cistern at end of shower $= (\frac{5}{6} \text{ of } \frac{3}{4}) + \frac{1}{3}$

$$= \frac{5}{8} + \frac{1}{3}$$

$$= \frac{27+32}{96}$$

$$= \frac{59}{96};$$

∴ The cistern was $(1 - \frac{59}{96})$ or $\underline{\frac{37}{96}\text{ths}}$ from being full at the end of the shower.

10. CORRESPONDENT.—From a bill of £3 11s. 8d., due 18 months hence, a tradesman deducts 5s.; what is the rate per cent. at which the true discount is calculated? (*Barnard Smith.*)

Present value of bill $= £3\ 11\text{s. } 8\text{d.} - 5\text{s.}$

$= £3\ 6\text{s. } 8\text{d.}$

$$\left.\begin{array}{l} £\ \ £ \\ 3\frac{1}{2} : 100 \\ \text{yrs. yr.} \\ 1\frac{1}{2} : 1 \end{array}\right\} :: £ \frac{1}{2} : \text{Rate per cent.}$$

∴ Rate per cent. $= \frac{\overset{5}{\cancel{100}} \times \overset{1}{\cancel{3}} \times \overset{1}{\cancel{1}}}{\underset{1}{\cancel{7}} \times \underset{1}{\cancel{3}} \times \underset{2}{\cancel{4}}}$

$= \underline{5}.$ Ans.

11. LASSUS.—$\frac{1}{3}$ of a package of cloth is sold at 2s. 6d. a yard, $\frac{1}{4}$ of it at 1s. 6d. a yard, and the remaining 25 yards at 1s. 10d. a yard, gaining 2d. a yard on the cost price; find the whole gain.

$\{1 - (\frac{1}{3} + \frac{1}{4})\}$ of package $= 25$ yards,

$\frac{5}{12}$ of package $= 25$ ,,

$\frac{1}{12}$ ,, $= 5$ ,,

∴ Package $= 60$ ,,

Cost price per yard $= 1\text{s. } 10\text{d.} - 2\text{d.}$

$= 1\text{s. } 8\text{d.};$

Gain on 25 yards $= 2\text{d.} \times 25$

$= 4\text{s. } 2\text{d.};$

Gain on $\frac{1}{3}$ of package $= (2\text{s. } 6\text{d.} - 1\text{s. } 8\text{d.}) \times 20$

$= 10\text{d.} \times 20$

$= 16\text{s. } 8\text{d.};$

Loss on $\frac{1}{4}$ ,, $= (1\text{s. } 8\text{d.} - 1\text{s. } 6\text{d.}) \times 15$

$= 2\text{d.} \times 15$

$= 2\text{s. } 6\text{d.};$

∴ Net gain $= 4\text{s. } 2\text{d.} + 16\text{s. } 8\text{d.} - 2\text{s. } 6\text{d.}$

$= \underline{18\text{s. } 4\text{d.}}$ Ans.

*Note.*—Your writing is *fair.*

12. F. S.—Four candles of different diameters are arranged in sockets at different levels and are lighted together; but when 1 inch of the longest candle has burned away the flames are seen to be precisely on a level. One candle is 7 in. long above the socket, and would be consumed in 3 hrs.; the rest in succession are $6\frac{1}{2}$, 6, and $5\frac{1}{2}$ inches long, and would burn away respectively in $3\frac{1}{2}$, 4, and $4\frac{1}{2}$ hrs. What are the differences of level between the sockets? (*Lower Division, Civil Service, May,* 1880.)

1 in. of longest candle is burnt in $\frac{1}{7}$ of 3 hrs. $= \frac{3}{7}$ hr.;

Part burned by 2nd candle in this time $= \left(\frac{3}{7} \text{ of } \frac{6\frac{1}{2}}{3\frac{1}{2}}\right)$ in.

$= \left(\frac{3}{7} \text{ of } \frac{13}{7}\right)$ in.

$= \frac{39}{49}$ in.;

,, ,, 3rd ,, ,, $= \left(\frac{3}{7} \text{ of } \frac{6}{4\frac{1}{2}}\right)$ in.

$= \frac{9}{14}$ in.;

,, ,, 4th ,, ,, $= \left(\frac{3}{7} \text{ of } \frac{5\frac{1}{2}}{4\frac{1}{2}}\right)$ in.

$= \left(\frac{3}{7} \text{ of } \frac{11}{9}\right)$ in.

$= \frac{11}{21}$ in.;

Part remaining of 1st candle $= 6$ in.;

,, ,, 2nd ,, $= (6\frac{1}{2} - \frac{39}{49})$ in.

$= 5\frac{59}{98}$ in.;

,, ,, 3rd ,, $= (6 - \frac{9}{14})$ in.

$= 5\frac{5}{14}$ in.;

,, ,, 4th ,, $= (5\frac{1}{2} - \frac{11}{21})$ in.

$= 4\frac{16}{21}$ in.;

∴ Differences of level between the sockets

$= (6 - 5\frac{59}{98})$ in., $(6 - 5\frac{5}{14})$ in., and $(6 - 4\frac{16}{21})$ in.

$= \underline{\frac{39}{98}}$ in., $\underline{\frac{9}{14}}$ in., and $\underline{1\frac{5}{21}}$ in. Ans.

13. SCIENCE.—What sum must a person have invested in the 3 per cents. at $93\frac{3}{4}$, if a transfer of $\frac{3}{5}$ of his capital to the 5 per cents. at 125 would increase his income £14 16s.? (*P. T. Examination, May,* 1880.)

Income on £1 in 1st stock $= \frac{3}{93\frac{3}{4}}$ £

$= \frac{4}{125}$ £;

,, ,, 2nd ,, $= \frac{5}{125}$ £

$= \frac{1}{25}$ £;

Difference of incomes on £1 $= (\frac{4}{125} - \frac{1}{25})$£

$= \frac{187 - 150}{4675}$ £

$= \frac{37}{4675}$ £;

£ £ s. £

∴ $\frac{37}{4675}$ : 14 16 :: 1 : Amount of capital transferred.

$= (14\frac{4}{5} \div \frac{37}{4675})$£

$= \left(\frac{74}{5} \times \frac{\overset{935}{\cancel{4675}}}{37}\right)$£

$= \underline{£1870}.$

∴ Sum invested $= £1870 \times \frac{5}{2}$

$= \underline{£4675}.$ Ans.

*Note.*—Each correspondent is restricted to *one* question. Your writing is *good*, but it is rather *too small.*

## General.

1. JANE EYRE.—The lessons on 'Macbeth,' given in the early issues of the *Governess*, will be published shortly in a separate form, price 1s.

2. E. K.—'A Talk about Language and Grammar' is published separately at 3d.

3. OWEN DAVIES should read *Morris's* 'English Grammar' and *Williams's* 'Oceans,' or selected chapters of any good work on Physical Geography.

4. ENDOLYMPH.—The lessons on 'Animal Physiology' given in the PRACTICAL TEACHER will meet the requirements of the Advanced Stage Examination of the Science and Art Department, but we cannot guarantee that the papers will be completed in the present volume. It is our aim to treat the subject exhaustively.

5. BURY.—EX. P. T.—'How to Draw a Map,' published by Joseph Hughes, will give you all information respecting the lines of latitude and longitude.

6. PSYCHOLOGY.—The only book on the subject you mention which will answer your purpose is *Dr. Coupland's* 'Discipline of the Mind' which ran through the old series of the *Governess*, and will be published in complete form at 1s. We will send you a copy immediately when ready upon receipt of 24 halfpenny stamps.

7. M. H.—You will find the solution of your query in our issue for May, 1882.

8. G. H. HARKER.—Your solution is correct, but you must take the value 292·303...miles, as the other is inapplicable. We obtained that result, but concluded you must have copied the question incorrectly, as the answer did not come an exact number of miles.

9. LIBRA.—The minus sign must be taken in the second quantity, when the sign in the first is plus, and vice versâ.

Thus:—$(\sqrt{b}\pm\sqrt{c})(\sqrt{b}\mp\sqrt{c})$.

When the first quantity is $(\sqrt{b}+\sqrt{c})$, the second will be $(\sqrt{b}-\sqrt{c})$; and when the first quantity is $(\sqrt{b}-\sqrt{c})$, the second will be $(\sqrt{b}+\sqrt{c})$.

Your writing is *very good*.

10. JOSEPH MAWSON, having now no further use of Volume I. of the PRACTICAL TEACHER, will willingly part with it; in good condition, unbound, 3s. 6d. Nutting Grove, Farnley, Leeds.

11. J. EDWARDS, Burton-on-Trent.—Your query is solved in our issue for October, 1882.

12. EXCISE.—We think your writing will gain the full percentage of marks, it being just the style required for the Civil Service.

13. X. Y. Z.—

But he who reigns
Monarch in heaven, till *then* as one *secure*
Sat on his throne, upheld by old repute,
Consent or custom, and his regal *state*
Put forth at full; but still his strength *conceal'd*,
*Which* tempted our attempt, and wrought our fall.
Henceforth his might we know, and *know* our own,
So as not *either* to provoke or dread
New war, *provok'd;* our better part remains
To work in close design, by fraud or guile,
*What* force effected not; *that* he no *less*
At length from us may find, who overcomes
By force, *hath* overcome *but* half his foe.'

*Paradise Lost, Book I.*

PARAPHRASE.

But He who is king in heaven had, till the time of our rebellion, occupied the throne by common consent, being maintained in His seat by the established opinion of all the inhabitants, displaying all the dignity of royalty, but hiding still His power. Now we have felt His might, and we have seen how great is our own, so that in time to come we shall be careful not to further rebel, nor yet shall we dread His power if it be arrayed against us. Henceforth our wisest course will be so to unite together that by cunning and deceit, we may accomplish that which by force we were unable to effect, and thus at last force even Him to acknowledge that an enemy conquered by force alone is but half o'erthrown.

| KIND OF SENT. | CONNECTIVE. | SUBJECT AND ENLARGEMENTS. | PREDICATE. | OBJECT AND ENLARGEMENTS. | EXTENSION OF PREDICATE. |
|---|---|---|---|---|---|
| (*a*) Princ. sent. adversative to preceding sent. | But | He, upheld by old repute, consent or custom, | sat | | on his throne (place) till then (time) |
| (*b*) Adv. to *a*. | as | one | [sits] | | [on His throne] |
| (*c*) Adj. to *one* in *b*. | [who] | [who] | [is] secure | | |
| (*d*) Adj. to he in *a*. | [who] | who Monarch | reigns | | in heaven (place) |
| (*e*) Princ. co-ord. with *a*. | and | his regal state | was put forth [=displayed] | | at full (manner) |
| (*f*) Princ. adv. to *a*. | but | his strength | [was] concealed | | still |
| (*g*) Adj. to *e*. | [which] | which | tempted | our attempt | |
| (*h*) Adj. to *e*, co-ord. with *g*. | and | [which] | wrought | our full | |
| (*i*) Princ. sent. | | we | know | his might | henceforth (time) |
| (*j*) Princ. co-ord. with *i*. | and | [we] | know | our own | so |
| (*k*) Adv. to *j*. | as not either | [we] | [shall] to provoke | new war | |
| (*l*) Adv. to *j*. | [not] or | [we] | [shall] dread | [new war] | |
| (*m*) Adv. to *l*. | [if] | [it] | [be] provoked | | |
| (*n*) Princ. sent. | (what = that which) | Our better part to work, in close design by fraud or guile *that* | remains | | |
| (*o*) Adj. to *n*. | [which] | force | effected | which | not (neg.) |
| (*p*) Adv. of reason to *n*. | that | he, no less | may find | | at length (time) from us (place) |
| (*q*) Noun sent. obj. to *p*. | [that] | he | hath overcome | but half his foe | |
| (*r*) Adj. to *q*. | (who) | who | overcomes | | by force. |

PARSING.

*Then*—Adv. of time used as abs. noun, neut. sing., obj., gov. by '*till*.'
*secure*—adj. of quality, qual. '*who*' und.
*state*—abs. noun, neut. sing. 3d., nom. to 'was put forth.'
*concealed*—past part. of '*to conceal*,' forming with *was* the passive voice past tense of 'to conceal'; referring to 'strength.'
*which*—rel. pronoun, neut. sing., nom. to '*tempted*,' and agreeing with its antecedent '*his strength was concealed*.'
*know*—irreg. trans. verb, act., ind., pres., plural, 1st, agreeing with '*we*' und.
*either*—correl. conj., forming with 'not' the correlative to [not] *or*, and introducing the sentence 'not either we shall to provoke.'
*provoked*—past part. of 'to provoke,' forming with '*be*' und. the present tense, passive voice, cond. mood, 3rd pers. sing. of 'to provoke,' referring to '*it*' und.
*what*—that which—comp. rel. pro.; *that*, sing. neuter, obj. gov. by '*to work*'; *which*, neut., sing. 3rd, obj. gov. by '*effected*.'
*that*—cop. conj. joining the sent. 'our better part remains,' etc., and 'he may find,' etc.
*less*—adj. of quality, qual. 'he' or 'person' understood.
*hath*—irr. int. verb. auxiliary to 'overcome,' and forming with it the 3rd pers. sing. ind. perf. of 'overcome,' and agreeing with 'he.'
*but*—adv. of degree, qualifying 'half.'

14. SERVUS MAGISTRO.—As a Candidate (scholar) you were presented in Standard VI. It is expected that after twelve months at your apprenticeship you should pass Stundard VII. (Art. 109 (g) vii.). We cannot otherwise understand your query.

15. NOLIOR should write to the Military Training College, Chelsea, S.W., for particulars.

16. ANNIE HIGHAM.—Clyde's *is* good, and will be useful afterwards.

17. PRECEPTOR'S edition of Shakespeare (the 'Globe') is excellent. Nelson's, 350 illustrations; and Routledge's, 4to. illustrated, 7s. 6d. The Leopold edition is 10s. 6d. *Nimmo's* 'Chaucer' 5s. *Hallam's* 'Literary History,' 7s. 6d., Ward, Lock and Co.

18. E. C. H.—We know of none. Practise on the 'Blackboard' itself.

19. PUZZLED must wait until next May to take Freehand and Perspective. The list of Science Subjects for the Q.S. Examination does not include Geology. See Schedule V.

20. SEPTIMUS can only '*claim*' what his indentures provide. See Schedule VI.

21. PUPIL TEACHER.—*Dr. Smith's* or *Dr. Morris's* 'English Grammar'; Public Schools' Latin Grammar and Greek Grammar. *Huxley's* 'Physiography' will serve your purpose. There are smaller text-books, but *you* should get the best at once.

22. DIVITIACUS.—'Proceed in new virtue, boy; thus it is gone to the stars.' 'New virtue gain, my boy; 'tis thus the stars are reached.' Writing fairly good; probably seventy per cent.

23. LONG 'UN.—Your query was solved in our issue for April, 1883.

24. QUONIAN.—You will find the solution of your query in our issue for January, 1882.

25. QUÆRITUR.—A translation of 'Hiero' is contained in one of Bohn's classical series. We do not find any separate annotated edition of the text in French or English catalogues.

26. ITHON.—There are seven stages in the 'Mathematics' of the Science Department's examinations. See 'Science Directory,' p. 86 (pr. 6d.). Details are there fully given.

27. A. WILSON.—Todhunter's works are among the best. Dr. Morris's Grammar. Hewitt's 'British Colonies.'

28. SUBSCRIBER.—There is no 'religious knowledge' subject at the Christmas Government examination for certificates. Send to Whitehall for a syllabus.

29. ANXIOUSNESS should obtain an Oxford University Calendar, which contains all details.

30. J. A. PRESTON must select for herself such *special* subjects as may suit her taste or preference. Send for a syllabus (Code, Art. 56, note). First-class Certificates can be obtained by service only (Art. 64). But J. A. P. may pass in the First Division, by steady and well-directed work, at Christmas, 1885.

31. WULFRUNA might advantageously study *Todhunter's* 'Algebra,' *Bright's* 'History of England,' Vol. III., and the 'Manual of School Management' published by the National Society.

32. 'W. H.' should consult *Johnstone's* 'Civil Servic Coach.' 3s. 6d.

33. J. EDWARDS.—*Clyde's* 'Geography.' 4s.

34. A. B.—By blackboard drawing do you mean 'model drawing'?

## Algebra.

1. T. D.—Simplify:—

$$\frac{2x}{\sqrt{3}+1}-\frac{2x}{\sqrt{3}-1}+\frac{1}{a+\sqrt{a^2-1}}+\frac{1}{a-\sqrt{a^2-1}}.$$

(*Knight.*)

$$\frac{2x}{\sqrt{3}+1}-\frac{2x}{\sqrt{3}-1}+\frac{1}{a+\sqrt{a^2-1}}+\frac{1}{a-\sqrt{a^2-1}}$$

$$=\frac{2x(\sqrt{3}-1)-2x(\sqrt{3}+1)}{(\sqrt{3}+1)(\sqrt{3}-1)}+\frac{a-\sqrt{a^2-1}+a+\sqrt{a^2-1}}{(a+\sqrt{a^2-1})(a-\sqrt{a^2-1})}$$

$$=\frac{2x\sqrt{3}-2x-2x\sqrt{3}-2x}{3-1}+\frac{2a}{a^2-(a^2-1)}$$

$$=\frac{-4x}{2}+\frac{2a}{1}$$

$$=-2x+2a$$

$$=2(a-x).$$ Ans.

*Note.*—*Todhunter's* 'Mensuration,' 2s. 6d.; *Elliott's* 'Mensuration,' 2s. (*Hughes*).

2. DARKY JUIRS.—Two persons, A and B, were employed together for 50 days at 5s. per day each. During this time A by spending 6d. a day less than B saved twice as much as B, besides the expenses of 2 days over. How much did A spend per day? (*Todhunter.*)

Let $x$ = A's daily expenses in pence,
Then, $x+6$ = B's " " " " ";

$$\therefore \quad 50(60-x)=2\times 50\{60-(x+6)\}+2x$$
$$3000-50x=100(60-x-6)+2x$$
$$=100(54-x)+2x$$
$$=5400-100x+2x$$
$$=5400-98x$$
$$98x-50x=5400-3000$$
$$48x=2400$$
$$\therefore x=50.$$

$\therefore$ A spent daily 50d. = 4s. 2d. Ans.

3. NEMO.—Solve:—

$$\sqrt{2x+7}+\sqrt{3x-18}=\sqrt{7x+1}$$
$$\sqrt{2x+7}+\sqrt{3x-18}=\sqrt{7x+1}$$
$$2x+7+2\sqrt{(2x+7)(3x-18)}+3x-18=7x+1$$
$$5x-11+2\sqrt{6x^2-15x-126}=7x+1$$
$$2\sqrt{6x^2-15x-126}=2x+12$$
$$\sqrt{6x^2-15x-126}=x+6$$
$$6x^2-15x-126=x^2+12x+36$$
$$5x^2-27x=162$$
$$x^2-\frac{27x}{5}=\frac{162}{5}$$
$$x^2-\frac{27x}{5}+\left(\frac{27}{10}\right)^2=\frac{162}{5}+\frac{729}{100}$$
$$=\frac{3240+729}{100}$$
$$=\frac{3969}{100}$$
$$x-\frac{27}{10}=\pm\frac{63}{10}$$
$$x=\pm\frac{63}{10}+\frac{27}{10}$$
$$\therefore x=9, \text{ or } -3\frac{3}{5}.$$ Ans.

4. INQUISITIVE.—Evaluate

$$\frac{2(x-y)(1-xy)(x+1)(y+1)}{(x^3+1)(y^3+1)}, \text{ when}$$

$x=\sqrt{2}-\sqrt{3}$ and $y=\sqrt{2}+\sqrt{3}$.

(*Edinburgh University*, 1882-3.)

$$\frac{2(x-y)(1-xy)(x+1)(y+1)}{(x^3+1)(y^3+1)}$$

$$=\frac{2(x-y)(1-xy)(x+1)(y+1)}{(x+1)(x^2-x+1)(y+1)(y^2-y+1)}$$

$$=\frac{2(x-y)(1-xy)}{(x^2-x+1)(y^2-y+1)}$$

$$=\frac{2\{\sqrt{2}-\sqrt{3}-(\sqrt{2}+\sqrt{3})\}\{1-(\sqrt{2}-\sqrt{3})(\sqrt{2}+\sqrt{3})\}}{\{(\sqrt{2}-\sqrt{3})^2-(\sqrt{2}-\sqrt{3})+1\}\{(\sqrt{2}+\sqrt{3})^2-(\sqrt{2}+\sqrt{3}(+1\}}$$

$$=\frac{2\{\sqrt{2}-\sqrt{3}-\sqrt{2}-\sqrt{3}\}\{1-(2-3)\}}{\{2-2\sqrt{6}+3-\sqrt{2}+\sqrt{3}+1\}\{2+2\sqrt{6}+3-\sqrt{2}-\sqrt{3}+1\}}$$

$$=\frac{2\times-2\sqrt{3}\times2}{\{6-2\sqrt{6}-\sqrt{2}+\sqrt{3}\}\{6+2\sqrt{6}-\sqrt{2}-\sqrt{3}\}}$$

$$=\frac{-8\sqrt{3}}{\{(6-\sqrt{2})-(2\sqrt{6}-\sqrt{3})\}\{(6-\sqrt{2})+(2\sqrt{6}-\sqrt{3})\}}$$

$$=\frac{-8\sqrt{3}}{(6-\sqrt{2})^2-(2\sqrt{6}-\sqrt{3})^2}$$

$$=\frac{-8\sqrt{3}}{36-12\sqrt{2}+2-(4\times6-4\sqrt{18}+3)}$$

$$=\frac{-8\sqrt{3}}{38-12\sqrt{2}-(27-12\sqrt{2})}$$

$$=\frac{-8\sqrt{3}}{38-12\sqrt{2}-27+12\sqrt{2}}$$

$$=\underline{-\frac{8\sqrt{3}}{11}}. \text{ Ans.}$$

5. T. B. B. B.—An oblong bit of land containing 9 acres 1 rood 16½ poles, is one-third as broad as it is long. What is the distance in poles (1) round it and (2) from one corner to the opposite one (three places of decimals). (*Fifth Year P. T. Examination.*)

Let $x$ = length in poles,

Then $\frac{x}{3}$ = breadth ,, ;

9 ac. 1 ro. 16½ po. = 1496½ po. ;

$$\therefore x\times\frac{x}{3}=1496\tfrac{1}{2}$$

$$\frac{x^2}{3}=\frac{4489}{3}$$

$$x^2=4489$$

$$\therefore \underline{x=67.}$$

Length = 67 poles,
Breadth = 22⅓ ,, ;

$\therefore$ Perimeter = $\{(67+22\tfrac{1}{3})\times2\}$ poles
= $(89\tfrac{1}{3}\times2)$ poles
= $\underline{178\tfrac{2}{3}\text{ poles.}}$ (1)

$\therefore$ Distance from corner to corner = $\sqrt{67^2+(\frac{67}{3})^2}$ poles
= $\sqrt{4489+\frac{4489}{9}}$ poles
= $\sqrt{4489+498\cdot7}$ poles
= $\sqrt{4987\cdot7}$ poles
= $\underline{70\cdot624\ldots\text{poles.}}$ (2)

6. CYMRO.—Solve :—

$$16^2=\left(12+\frac{x\sqrt{3}}{2}\right)^2+\left(\frac{x}{2}\right)^2.$$

$$16^2=\left(12+\frac{x\sqrt{3}}{2}\right)^2+\left(\frac{x}{2}\right)^2$$

$$256=144+12x\sqrt{3}+\frac{3x^2}{4}+\frac{x^2}{4}$$

$$112=12x\sqrt{3}+x^2$$

$$x^2+12x\sqrt{3}=112$$

$$x^2+12x\sqrt{3}+(6\sqrt{3})^2=112+108$$
$$=220$$

$$x+6\sqrt{3}=\pm\sqrt{220}$$

$$\therefore \underline{x=\pm\sqrt{220}-6\sqrt{3}.}$$

## Mensuration.

1. Ανδια.—Shew by examples that if a square and a rectangle have equal perimeters, the area of the square exceeds the area of the rectangle, by the area of a square the side of which is half the difference of the sides of the rectangle. (*Todhunter.*)

Suppose side of square = 1,
Then perimeter = 4 ;
Sides of rectangle with an equal perimeter are 1½ and ½, or 1¾ and ¼, etc. ;
Area of square = 1 ;
,, rectangle = $(1\tfrac{1}{2}\times\tfrac{1}{2})$, or $(1\tfrac{3}{4}\times\tfrac{1}{4})$
= ¾, or $\frac{7}{16}$ :
½ difference of sides of rectangle = $(1\tfrac{1}{2}-\tfrac{1}{2})\div2$,
or $(1\tfrac{3}{4}-\tfrac{1}{4})\div2$
= ½, or ⅜ ;
Area of square − area of rectangle
= 1 − ¾, or $1-\frac{7}{16}$
= ¼, or $\frac{9}{16}$
$\underline{=(\frac{1}{2})^2, \text{ or } (\frac{3}{4})^2.}$

2. T. B. B. B.—A box with square ends 1⅜ ft. wide takes 84⅜ ft. of board 12 inches wide to make it. What is the length of the lid? (*Fifth Year P.T. Examination.*)

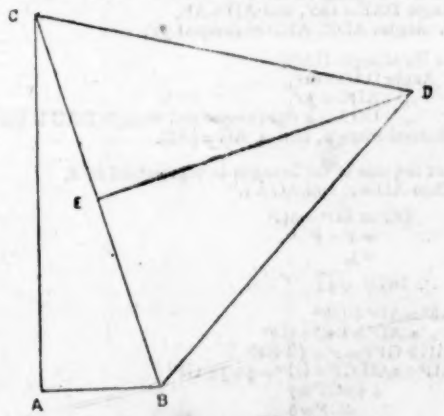
Quantity of wood required = $84\frac{3}{8}$ ft. × 12 in.
= $84\frac{3}{8}$ sq. ft. ;
Area of the ends = $(1\frac{3}{8}\text{ ft.})^2\times2$
= $\frac{121}{32}$ sq. ft.
= $3\frac{25}{32}$ sq. ft.
,, ,, other sides = Length × $1\frac{3}{8}$ ft. × 4
= Length × $\frac{11}{2}$ ft. ;
$\therefore$ Length × $\frac{11}{2}$ ft. = $84\frac{3}{8}$ sq. ft. − $3\frac{25}{32}$ sq. ft.
= $81\frac{7}{32}$ sq. ft.
= $\frac{2607}{32}$ sq. ft.
$\therefore$ Length = $\frac{2607}{32}$ sq. ft. ÷ $\frac{11}{2}$ ft.

$$=\left(\frac{2607}{16}\times\frac{2}{11}\right)\text{ft.}$$

$$=\frac{237}{8}\text{ ft.}$$

$$=\underline{14\tfrac{5}{8}\text{ ft.}}\quad\text{Ans.}$$

3. THIRD YEAR PUPIL TEACHER.—Two adjacent sides of a quadrilateral are 228 ft. and 704 ft. respectively, and the angle contained by them is 90° ; the other sides are equal, and the angle contained by them is 60° ; show that the area of the quadrilateral in sq. ft. is $80{,}256+136{,}900\sqrt{3}$. (*Todhunter.*)




Area of triangle BAC = $\frac{CA\times AB}{2}$

$$=\frac{704\times228}{2}$$

$$=80{,}256.$$

Angle CDB = 60°, and DC = DB,
∴ Triangle CDB is equilateral.

$CB^2 = CA^2 + AB^2$ (I. 47.)
$= 704^2 + 228^2$
$= 495,616 + 51,984$
$= 547,600,$

$\therefore CB = \sqrt{547,600}$
$= 740.$

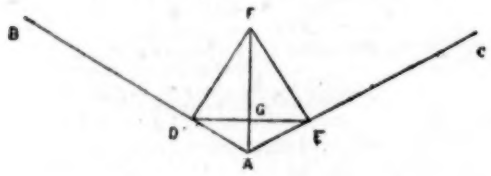
$DE^2 = CD^2 - CE^2$
$= CB^2 - \left(\frac{CB}{2}\right)^2$
$= CB^2 - \frac{CB^2}{4}$
$= \frac{3}{4}CB^2,$

$\therefore DE = \frac{\sqrt{3}}{2} CB$
$= \frac{\sqrt{3}}{2} \times 740$
$= 370\sqrt{3};$

Area of triangle $CDB = CE \times ED$
$= 370 \times 370\sqrt{3}$
$= 136,900\sqrt{3}.$

∴ Area of quadrilateral
$= \underline{(80,256 + 136,900\sqrt{3})}$ sq. ft.

4. SPHINX.—A circle rolls within a regular hexagon, and comes in contact with half of each side as it rolls. Compare the radius of the circle and the side of the hexagon. (*Certificate*, 1878.)




Let AB, AC represent two adjacent sides of the hexagon; then the angle BAC = 120°.

If D, E be the points of contact of the circle with AB, AC, then AD, AE are each ½ of the side of the hexagon, as the circle comes in contact with half of each side as it rolls.

Draw DF, EF at right angles to AB, AC respectively, and join AF.

Then FD, FE are radii of the circle, and AF bisects angle BAC.

Join DE, cutting AF in G.
Angle DAE = 120°, and AD = AE,
∴ Angles ADE, AED each equal 30°.

In the triangle DAG,
Angle DAG = 60°,
,, ADG = 30°,
∴ ,, DGA is a right angle, and triangle DAG is half of an equilateral triangle, that is, AG = ½AD.

Let the side of the hexagon be represented by 8,
Then AD = 2, and AG = 1.

$DG^2 = AD^2 - AG^2$
$= 2^2 - 1^2$
$= 3,$

$\therefore DG = \sqrt{3};$

$AF^2 = AD^2 + DF^2$
$= AD^2 + DG^2 + GF^2$
$(AG + GF)^2 = 2^2 + 3 + GF^2$
$AG^2 + 2AG.GF + GF^2 = 4 + 3 + GF^2$
$1 + 2GF = 7$
$2GF = 6$
$\therefore GF = 3;$

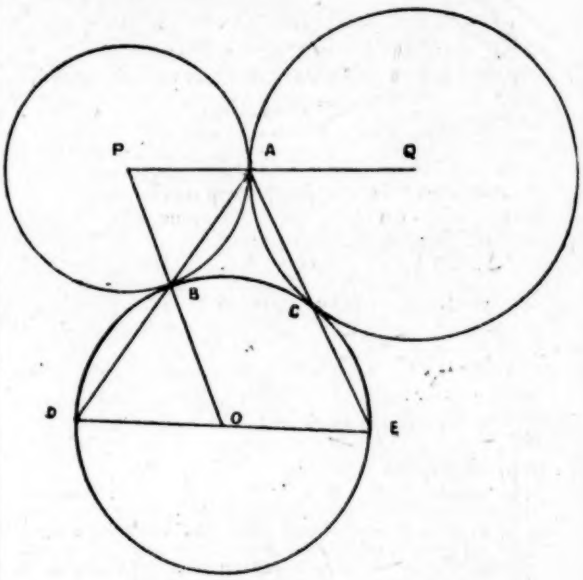
$DF^2 = DG^2 + GF^2$
$= 3 + 3^2$
$= 3 + 9$
$= 12,$

$\therefore DF = \sqrt{12}$
$= \underline{2\sqrt{3}}$

∴ Radius of circle : side of hexagon :: $2\sqrt{3} : 8$
:: $\underline{\sqrt{3} : 4}$.

## Geometry.

1. P. M.—Three circles touch one another externally at the points A, B, C; from A, the straight lines AB, AC are produced to cut the circle BC at D and E; shew that DE is a diameter of BC, and is parallel to the straight line joining the centres of the other circles. (*Todhunter.*)




Find O, P, Q, the centres of the three circles respectively.
Join OD, OE, PQ, and PO.

*Proof.*— ∠ PAB = ∠ PBA, (I. 5.)
But ∠ PBA = ∠ OBD, (I. 15.)
and ∠ OBD = ∠ ODB, (I. 5.)
∴ ∠ PAB = ∠ ODB;

Wherefore PA is parallel to DO. (I. 27.)
Similarly it can be proved that QA is parallel to EO.
But PA and QA form one straight line; (III. 12.)

∴ OD and OE form one straight line, which is a diameter of the circle DBCE, and is parallel to PQ. Q. E. D.

# Lessons in Latin.

BY THE REV. A. D. CAPEL, M.A., CANTAB.,

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## KEY TO EXERCISES.

### EXERCISE 25.

### A.

Mĕrx vĕ | nīt mĕr | cēsquĕ vĕ | nīt quæ | sītă lă | bōrĕ ‖
Vōcĕ că | nēs; dūc | ējă că | nēs " nīsī | tĕmpŏră | cānēs ‖
Clāvă fĕ | rīt: clā | vūs " fīr | māt; clā | vīsquĕ rĕ | clūdĭt ‖
Ut plăcĕ | ās cŏmĭ | tī," mō | res cŏmēs | ĭndŭĕ | cōmēs ‖
Cōmæ | dī scē | .nam, " cŏmĕ | dōnēs | quærītĕ | cēnām ‖
Cōnsŭlĕ | dōctō | rēs; " sīc | tū tĭbĭ | cōnsŭlĭs | ĭpsĭ ‖
Bellān | dĭ cŭpĭ | dŏ " nŏcŭ | ĭt sŭă | sæpĕ cŭ | pīdō ‖
Cārmĭnă | dīcūn | tūr, " Dōmĭn | ō dūm | tĕmplă dĭ | cāntūr
Sōlvĕrĕ | dīffĭ | dit " nō | dūm quĭ | dīffĭdĭt | ēnsĕ ‖

Uxōr | ēm dū | cīt " vir | nūbīt | spōsă mă | rītō ‖
Edūcăt | hic cătŭ | lōs, " ūt | mōx ē | dūcăt ĭn | āprōs ‖
Si tĭbĭ | nōn ēst | æs " ēs ĭn | ops, ēt | pĭnguĭă | nōn ēs ‖
Fāllīt | sæpē frē | tūm plăcĭ | do nīmĭs | æquŏrē | frētūm ‖
Sōl nū | bēs fŭgăt | ēt " fŭgĭt | ĭrrĕpă | răbĭlē | tēmpūs ‖
Pĕr quŏd | quīs pĕc | cāt, " pĕr ĭ | dēmmōx | plēctitŭr | ĭdēm ‖
Dĭffĭcĭl | lĭs lăbŏr | ēst, cū | jūs sūb | pōndĕrē | lăbŏr ‖
Frōns pŭĕr' | ēst lĕ | vĭs, lĕvĭs | aūtēm | lĭnguă pŭ | ĕllæ ‖
In cām | pis lĕpŏ | rēs, " ĭn | lĭbrĭs | quærē lĕ | pŏrēs ‖
Nōn lĭcĕt | āssĕ mĭ | hĭ quī | mē nōn | āssĕ lĭ | cĕtŭr ‖
Māl' ĕgŏ | mălă mē | ă " bŏnă | quām mălă | frāngĕrē | mălă ‖

B.

1. Carthagine manendum est ut naves conservemus. 2. Pater sua manu suum filium verberabat, ut recitata disceret. 3. Nemo hieme natat. 4. Brutus, cum suis militibus, virtute Tarquinium vicit. 5. Romani quatuor naves in prælio amiserunt. 6. Secundo anno post reges expulsos Tarquinius Romam pœne cepit. 7. Hieme ursi in arbore aut in antro dormiunt. 8. Suas manus in frigidam aquam merserunt. 9. Ad flumen descendendum est ut lavemus. 10. Pyrrhus in Asia magnum bellum finivit.

## EXERCISE 26.

A.

1. You wrote a letter with your own hand. 2. O soldiers, you fought bravely. 3. You have broken your word, O boy; therefore I shall whip you. 4. You have preserved the city, O soldiers. 5. You have hurt your father, my son. 6. We have written a letter about you to your father. 7. Hannibal, the son of Hamilcar, led the Africans against the Romans. 8. Hannibal crossed the Alps. 9. You, O Cornelius, destroyed the Samnites in great battles. 10. Pyrrhus, the King of Epirus, used to trace his origin from the stock of Achilles.

B.

1. Vos, pueri, vestrum magistrum lœsistis. 2. Corneli, tuos hostes confecisti et patriam conservavisti. 3. Puellæ in horto juxta amnem ambulaverant. 4. Volsci bellum renovaverunt et Coriolos amiserunt. 5. Secundo anno, Valerius, Bruti collega, quater consul, morbo periit. 6. Vos, pueri, diutius lusistis. 7. Nonne tuam sororem, clam matrem (better matre) reliquisti. 8. Ad Africam venisti ut altum montem videas. 9. Nonne epistolam tuo patri scripsisti, ut eam ad matrem mittat. 10. Æstate pueris natandum est.

## EXERCISE 27.

A.

1. The boy who was swimming in the river perished. 2. Cæsar, who took Gaul, returned to Rome. 3. My mother, whom all men loved, died from disease in the fifth year after the death of her husband. 4. The sun whic' warms kings and slaves, fills all things with its light. 5. God, who does all things rightly, loves both men and all animals. 6. You, O boys, who have said your lessons, will now play. 7. He slew his brother whom his mother loved. 8. Horace slew his sister, whose weeping annoyed him. 9. I have learnt my lesson, shall I not run into the meadow? 10. We must learn that we may be wise

B.

1. Pyrrhus, cujus milites naves amiserunt, ad Africam fugit. 2. Cuncti, qui carmen audiverunt, gaudio saltaverunt. 3. Puella, cujus mater abierat (this sentence is incomplete). 4. Puer, quem heri verberavi, sua recitata hodie discit. 5. Hominibus, qui pueros docent, discendum est. 6. Populo, qui urbem reliquit, multos et bonos sermones prædicavit. 7. Brutum matronæ Romanæ, qui pudicitiam suam defenderat, per annum luxerunt. 8. Cuncti, qui Ciceronem audiverunt, eloquentiam perceperunt. 9. Deus, qui cuncta vides, et cœlum habitas, meum filium cepisti. 10. Vulpes, cujus catuli in gramine jacebant, canes et venatores vidit.

## LESSON XXVIII.

### PASSIVE VOICE, THIRD PERSON.

218. I presume that all who are doing these exercises are thoroughly cognizant of the difference between an active and a passive verb; but if any one should not know, all he has to do is to find the subject, and then ask himself whether the subject does (active) the action or suffers (passive) it.

219. To examine 'The boy loved his mother, who was killed in the accident,' in the sentence, 'Boy loved his mother,' the subject, 'boy,' does something, therefore 'love' is active; whereas in the sentence, 'She was killed in the accident,' 'she,' the subject, suffers something, therefore 'was killed' is in the passive voice.

220. The third persons singular and plural of all tenses of the passive voice formed from the present root are the corresponding forms in the active voice with 'ur' added on, as 'arat,' he ploughs;' 'aratur,' 'it is ploughed;' 'monebat,' 'she was advising;' 'monebatur,' 'she was being advised.'

221. 'By' after a passive verb, if followed by the name of man or an animal, must be expressed by 'a' or 'ab' (before a vowel or 'h').

222. VOCABULARY 28.

| *English.* | *Latin.* | | *Derivative.* |
|---|---|---|---|
| For<br>In behalf of | Pro, prep. gov. ab. case | | |
| Power | Pŏtestas | G. Potestātis | Potentate |
| To shake | Quătĕre | P. R. Quass | Earthquake |
| Triumph<br>Procession | Pompa | G. Pompæ | Pomp |
| Camillus | Camillus | G. Camilli | |
| Badly | Male, an adv. | | |
| Contest | Certāmen | G. Certamĭnis | |
| Ring | Torques | G. Torquis, m. g. | |
| To take away | Tollere | P. R. Sustul | |
| Torquatus | Torquatus | G. Torquati | |
| Surname | Cognōmen | G. Cognomĭnis, n. g. | |
| To receive<br>To accept | Accĭpĕre | P. R. Accēp | Acceptance |
| There | Ibi, an adv. | | |
| Breath | Anĭma | G. Animæ | Animal |
| Fruit | Fructus | G. Fructūs | Fructify |
| Never | Nunquam, adv. | | |
| Woman | Fēmĭna | G. Feminæ | Feminine |
| To sow | Sĕrĕre | P. R. Sēvi | |
| To weep<br>To shed tears | Flĕre | P. R. Flev | |
| | *m. f. n.* | | |
| Miserable | Miser -ra -rum | R. Miser | Miser |
| Much (many) | Multūm, an adv. | | |
| To find | Invĕnīre | P. R. Invĕn | Invention |
| To buy | Emĕre | P. R. Em | Redemption |
| To set up | Erigĕre | P. R. Erex | Erection |
| Yoke | Jugum | G. Jugi, n.g. | |

| | | | |
|---|---|---|---|
| For the moment | Præsenti, an abl. case used as an adv. | | |
| Valley | Vallis | G. Vallis | |
| To bring low / To humble | Immĭnuĕre | P. R. Imminu | |
| To honour | Hŏnōrāre | R. Honor | Honorarium |
| Hero | Hēro | G. Herois | Heroic |
| Traitor | Prŏdĭtor | G. Proditōris | |
| Praying (against) | Dēprĕcātio | G. Deprecationis | Deprecate |

223. EXERCISE 28.

A.

1. Puer (7) qui dictata (12) didicit (27) a magistro (13) laudatur (2). 2. Amabuntur (2) qui pro patria (10) perierunt (26) 3. Potestates quæ in cœlo (27) quatientur. 4. Magna (20) pompa Camillo dabatur (12) qui multos (20) Romanorum (20) hostes (10) vicerat (23). 5. Manlius (Eng., Manlius) qui Gallum (10) in certamine occidit (4), et a (26) digito (18) torquem sustulit, Torquati cognomen accepit. 6. Puer (7) ad arborem (1) ducitur (9) ut ibi verberetur (16). 7. Bene (21) a consule (17) res (13) geritur (16). 8. Anima quam ducimus (9) (Eng., draw) a Deo (27) hominibus (5) datur (12). 9. Agricola (7) arborem (1) cujus fructūs nunquam adspiciet (18) sevit. 10. Filium (7) non invenerunt, cui panem (14) emerant.

B.

1. The father (14) who teaches (3) his (20) sons (7) well (21) is praised (2) by all (27) (men). 2. The mother (14) whose daughters (7) are being badly taught (3) is miserable. 3. Men (5) must work (12) and women must weep. 4. Must we not all (27) walk (3) under (16) the yoke which is being set up? 5. A boy (7) who is being whipped (16) does not love (2) his (20) master (13) for-the-moment. 6. The valley shall be filled (12) and the mountain (20) brought low. 7. I love (2) to hear of (Lat., de with ab) heroes who have perished (26) for (see vocab.) their country (10). 8. No one (17) took (26) the city (7) (of) Rome (20) in the times (7) of the kings (8), but (6) it was nearly (26) being taken (26) by Coriolanus (Lat., same word, o decl.) the traitor. 9. The wife (9) and mother (14) of Coriolanus by their (20) weeping (27) and praying only (19) (Eng., alone) saved (10) the city (7). 10. All (27) good (20) (men) are loved (2) by their (20) citizens (8) (Eng., own countrymen).

(*To be continued.*)

—o—

# Music.

BY RALPH DUNSTAN, MUS. BAC., CANTAB.;
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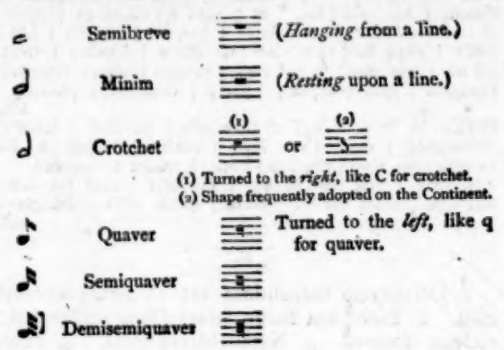
(Continued from page 300.)

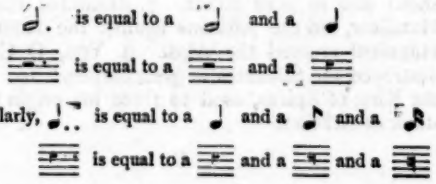
RESTS.—Rests are signs employed to denote 'periods of *silence*,' the exact length of each silent period being indicated by the *shape* of the rest. Thus, while *notes* are used to represent duration of *sound*, *rests* are used to represent duration of *silence*. Each note has its corresponding or equivalent rest:—

NOTES AND RESTS.




Distinguish carefully between the semibreve and minim rests, and between the crotchet and quaver rests.

Rests are generally written in the *third* space of either treble or bass stave, with the tails turned *downwards*. *Dots* are used after rests in the same way as after notes, and increase their value to the same extent: thus:—




TIME AND ACCENT.—The word *time* has a twofold meaning in musical language; it refers to the *duration* of a single sound (note), and also to the regular recurrence of *accents*. An accent is caused by giving more prominence or force to one note than to others. *Three* degrees of accent are recognised in music, viz., (1) strong, (2) medium, (3) weak. The strong and weak accents are easily distinguished, as in the words 'thickness,' 'distance,' 'vigour,' etc., in each of which a STRONG accent is followed by a *weak*; and, again, in 'redress,' 'invite,' 'conclude,' etc., where the order of accents is *weak*, STRONG. Many lines of poetry consist of strong and weak accents only, following each other alternately.

The *medium* accent can be observed in 'voluntary' (STRONG, *weak*, medium, *weak*), 'ability' (*weak*, STRONG, *weak*, medium), 'adoration' (medium, *weak*, STRONG, *weak*), etc.

In music, accent is marked by singing or playing the strong accent with more loudness or force, the weak accent being taken lightly, and a *medium* or moderate force employed for the medium accent.

BAR OR MEASURE.—When accents recur in regular order they can be arranged in *similar successive* groups, which in poetry are called *feet*, and in music *measures*, or *bars*.

Thus:—STRONG, *weak*, STRONG, *weak*, STRONG, *weak* may be written in three groups or measures,

| STRONG, *weak* | STRONG, *weak* | STRONG, *weak* ‖;

*weak*, STRONG, *weak*, STRONG, *weak*, STRONG, is precisely the same, but with a preliminary *weak* accent:—

*weak* | STRONG, *weak* | STRONG, *weak* | STRONG.

In music (both Sol-fa and Staff Notations), a bar-line is always drawn *before* a strong accent; or in other words, *a strong accent always follows a bar-line.*

The time between one *strong* accent and the next is called a Measure or Bar.

NOTES AND RESTS IN SOL-FA.—PULSE.—Each accent marks what is called a *pulse* or *beat.* The strong accent, or pulse, is always preceded by a line, and the weak accent, or pulse, by a colon, thus:

| : | : | } etc.
STRONG, *weak* STRONG, *weak*

Measures are named according to the number of pulses they contain. The kinds of measure most commonly employed are Two-pulse Measure, Three-pulse Measure, Four-pulse Measure, Six-pulse Measure, and Nine-pulse Measure.

TWO-PULSE MEASURE.—In two-pulse measure, only the STRONG and *weak* accents are used, the notes being written in the spaces left for them between the marks denoting the accent. If a piece of music written in two-pulse measure begin with the *strong* accent, it is said to be in the *primary* form of two-pulse measure:

{ | d :m | s :m | r :d | r :— ‖

The *secondary* form of two-pulse measure begins with the weak accent—

{ :d | m :r | f :m | l :s | d ‖

N.B.—A double-bar ‖ is used at the end of a piece of music, or at the close of a section or phrase of the tune. The *end of a line* of Sol-fa, unless occupied by a double-bar, is always marked thus:— }, *not* with a bar-line | , as in Staff-Notation.

Two-pulse Measure.—

Primary Form.

{ | d :r | m :d | m :s | r :d ‖
STRONG, *weak.* STRONG, *weak.* STRONG, *weak.* STRONG, *weak.*

Secondary Form.

{ :m | r :d | d' :t | l :s | d ‖
*weak.* STRONG, *weak.* STRONG, *weak.* STRONG, *weak.* STRONG.

THREE-PULSE MEASURE.—The primary form of three-pulse measure begins with the *strong* aecent, and each measure consists of three accents—STRONG, *weak*, *weak.*

{ | d :m :m | s :m :d | r :m :f | m :r :d ‖

The secondary form begins with the *weak* accent, thus:—*weak*, STRONG, *weak*, *weak*, STRONG, *weak*, etc.

{ :m | s :d' :m | s :f :r | d :t, :r | d :— ‖

In *slow* music the second accent in three-pulse measure acquires a little more force, becoming, in fact, a *medium* accent, thus:—STRONG, medium *weak.*

Three-pulse Measure.—

Primary Form.

{ | m :f :s | l :s :d | r :f :l }
{ | STRONG, *weak*, *weak.* | STRONG, *weak*, *weak.* | STRONG, *weak*, *weak.* }

{ | d :— :— ‖
{ | STRONG, *weak*, *weak.* ‖

Secondary Form.

{ :d | m :f :r | d :d' :t }
{ *weak.* | STRONG, *weak*, *weak.* | STRONG, *weak*, *weak.* }

{ | l :s :f | m :— ‖
{ | STRONG, *weak*, *weak.* | STRONG, *weak* ‖

A Third Form (rarely used).

{ :d :m | f :l :s | m :l, :t, | d
{ *weak*, *weak.* | STRONG, *weak*, *weak.* | STRONG, *weak*, *weak.* | STRONG ‖

FOUR-PULSE MEASURE.—In the primary form of four-pulse measure the accents recur in the order of STRONG, *weak*, medium, *weak*, and so on. The medium accent is shown by a *shorter and thinner* line than that which precedes the strong accent, thus:—

| Strong, weak, medium, weak. ‖
| : | : ‖

One four-pulse measure is equal to two two-pulse measures, the medium accent taking the place of the second strong accent, thus affording more variety and elegance.

There are *four* forms of this measure, viz.:—

Primary form | STRONG : *weak* | medium : *weak* ‖
Second form { : weak | STRONG : *weak* | medium ‖
Third form { : *weak* | medium : *weak* | STRONG ‖
Fourth form | medium : *weak* | STRONG : *weak* ‖

SIMPLE MEASURES.—Two-pulse, three-pulse, and four-pulse measures are said to be *simple;* all other kinds of measure, being formed by combining these, are called *compound.*

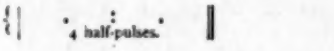
PULSES, CONTINUED AND DIVIDED.—The pulse is the *unit* of duration, and may be multiplied or divided.

When a note is sustained for more than one pulse it is said to be *continued;* and a note may be continued during any number of pulses. The pitch name of the note is written *once* only, and short horizontal lines are used for the succeeding pulses, thus:—

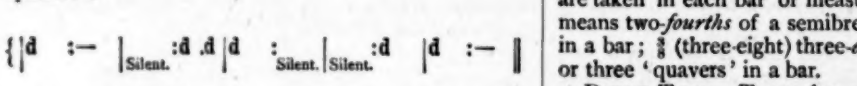
{ | d :— | — :d ‖
3 pulses..... .... 1 pulse.

{ | d :— :— | — :d :— | d :— :— | — :— :— ‖
4 pulses..... .... 2 pulses. 6 pulses..... .....

HALF PULSES are indicated by a dot dividing the pulse into two equal portions :—




SILENT PULSES or RESTS are shown by leaving *blank* spaces :—



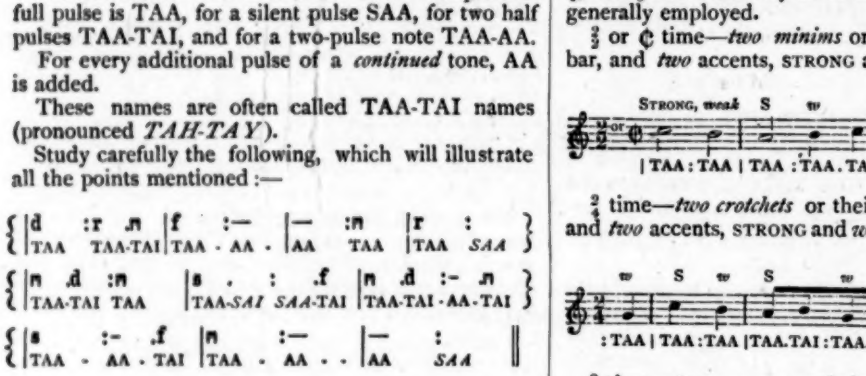

It is important to remember that a pulse may be of any length, but all pulses in the *same* piece of music must be exactly *equal.*

TIME-NAMES.—The time-name for a complete or full pulse is TAA, for a silent pulse SAA, for two half pulses TAA-TAI, and for a two-pulse note TAA-AA.

For every additional pulse of a *continued* tone, AA is added.

These names are often called TAA-TAI names (pronounced *TAH-TAY*).

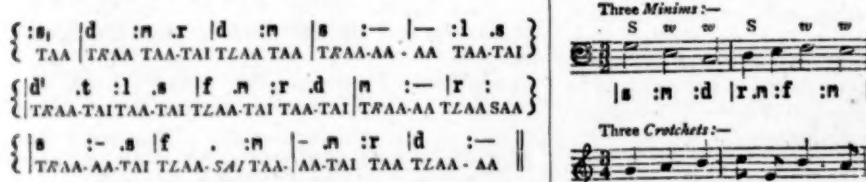
Study carefully the following, which will illustrate all the points mentioned :—



It will be seen from the above that we employ *half-pulse silences* or rests, and that notes may be a *pulse and half* in length, etc. In fact, *any* combinations of pulses, half-pulses, continuations, and silences are available.

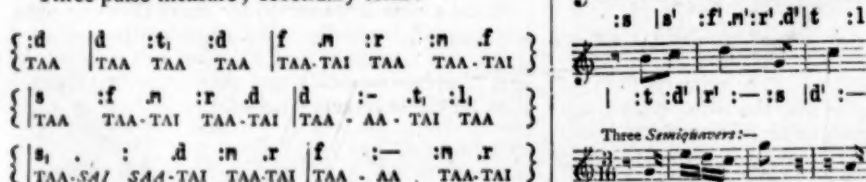
*Strong* accents may be shown in TAA-TAI-ing, by inserting an R after the T, as TRAA; and *medium* accents by inserting an L, as TLAA. Notice the following :—

Four-pulse measure ; *secondary* form.



It is not often *necessary* to show the strong and medium accents in this way. Simple taa-tai-ing is generally sufficient.

Three-pulse measure ; secondary form :—



SIMPLE TIMES AND TIME-SIGNATURES IN STAFF NOTATION.—In Sol-fa it is not necessary to place any signs at the beginning to indicate the kind of measure, the accent marks are sufficient for this purpose ; but in Staff Notation a *time-signature* must be employed.

Time-signatures generally consist of figures, as $\frac{2}{4}$, $\frac{3}{8}$ ; the *lower* number refers to the division of a *semibreve*, the *upper* shows how many of such divisions are taken in each bar or measure ; thus $\frac{2}{4}$ (two-four) means two-*fourths* of a semibreve, or two 'crotchets' in a bar ; $\frac{3}{8}$ (three-eight) three-*eighths* of a semibreve, or three 'quavers' in a bar.

DUPLE TIME.—Two-pulse measure may be called *Duple* time, a name much employed by modern writers. *Any* division of a semibreve may be selected for a *pulse*, so that the *possible* varieties of duple time are, $\frac{2}{2}$, $\frac{2}{4}$, $\frac{2}{8}$, $\frac{2}{16}$, and $\frac{2}{32}$. Of these, however, only $\frac{2}{2}$, $\frac{2}{4}$, and $\frac{2}{8}$ are commonly used. For $\frac{2}{2}$ the signature ¢ is generally employed.

$\frac{2}{2}$ or ¢ time—*two minims* or their equivalents in a bar, and *two* accents, STRONG and *weak* :—

$\frac{2}{4}$ time—*two crotchets* or their equivalents in a bar, and *two* accents, STRONG and *weak* :—

$\frac{2}{8}$ time—*two quavers* or their equivalents :—

*Triple time*, or three-pulse measure, is shown by the *time-signatures*, $\frac{3}{2}$, $\frac{3}{4}$, $\frac{3}{8}$, and $\frac{3}{16}$, each measure or bar containing *three* accents—STRONG, *weak, weak ;* or, in slow music, STRONG, medium, *weak* :—

*(To be continued.)*

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## Recent Inspection Questions.

[*The Editor respectfully solicits contributions—all of which will be regarded as* STRICTLY PRIVATE—*to this column. For obvious reasons, it cannot be stated in which district the questions have been set.*]

### Arithmetic.

STANDARD I. (DICTATED).

(1) 76+780+82+234+45=1217. Ans.
(2) 976−789=187. Ans.
(3) 430−17=413. Ans.

STANDARD II. (DICTATED).

(1) 29,016−482=28,534. Ans.
(2) 40,950×779=31,900,050. Ans.
(3) 40,548÷6=6758. Ans.

STANDARD III.

(1) Discover the quotient when the dividend is 650,907 and the divisor 507. Ans. 1283, −426 rem.

(2) A boy saves 2 penny postage stamps daily. How much will he save in 4 years (one of them leap year)? Ans. £12 3s. 6d.

(3) A gentleman owed for rent £2567 16s. 0d. but paid £2314 15s. 6d. How much had he still to pay? Ans. £253 0s. 6d.

(4) £7 19s. 6d.+£3560 12s. 6d.+£569 16s. 4d. +£2356 16s. 10d. Ans. £6495 5s. 2d.

(5) Subtract £5695 16s. 9d. from £9654 12s. 6d. Ans. £3958 15s. 9d.

STANDARD IV.

(1) £2 0s. 9¾d.×979. Ans. £1997 15s. 5¼d.

(2) How far would a train travelling 61 feet a second go in half an hour?
Ans. 20 miles 1400 yards.

(3) Reduce 6 ac. 3 rd. 30 pls. 3 yds. 94 in. to inches. Ans. 43,520,422.

(4) £13,766 13s. 6¾d.÷14,702.
Ans. 18s. 8½d., −13,615.

STANDARD V.

(1) 7 c. yd. 14 c. ft. 15 c. in. at £5 10s. 4d. a c. yd. Ans. £41 9s. $6\frac{3601}{3888}$d.

(2) 805 articles at £34 6s. 2d. each.
Ans. £27,618 4s. 2d.

(3) If £296 10s. be lent for 460 days, how long should £184 6s. 3d. be lent for?
Ans. $739\frac{2222}{2944}$ days.

(4) Bill:—3½ dozen umbrellas at 73s. for 3; 7 cheeses at 6s. 8d. for 2; 9 hats at 3s. 6d. each; 140 horses at £14 15s. each. Ans. £2118 16s. 10d.

STANDARD VI.

(1) Simplify $(3+\frac{1}{3}-\frac{1}{4})\div(3\frac{3}{4}\times 1\frac{1}{5})$. Ans. $\frac{37}{45}$.

(2) If 5 men or 6 women do a piece of work in 20 days, how long will it take 3 men and 5 women to do it? Ans. $13\frac{1}{13}$ days.

(3) 2·05 ton+·75 cwt.+2·15 qr.+2·75 lb.+2·15 oz. Ans. 2 ton 2 cwt. 1 qr. 7 lb. $1\frac{7}{10}$ oz.

(4) If 21 horses plough 42 ac. in 8 days, how many horses will plough 133 acres in $6\frac{1}{3}$ days? Ans. 84.

STANDARD VII.

(1) Find the value of 3 cwt. $22\frac{3}{4}$ lbs. at 13s. 9¾d. per cwt. Ans. £2 4s. $2\frac{2}{28}$d.

(2) Find simp. int. on £240 13s. 9d. for 5 yrs. 73 days at $3\frac{3}{4}$ per cent. Ans. £46 18s. $8\frac{7}{10}$d.

(3) Find comp. int. on £240 for 3 years at 5 per cent. Ans. £37 16s. 7½d.

(4) Simplify $(\cdot 15-\cdot 085)\frac{1\cdot 725}{\cdot 73206}$. Ans. $\frac{1725}{15804}$.

(5) In what time will the interest on £451 10s. at 5 per cent. amount to £1 7s. 11d.?
Ans. $22\frac{3013}{5415}$ days.

## Publications Reviewed.

**Readings in Social Economy.** By Mrs. F. Fenwick Miller. London: Longmans and Co.

The author of this book is a well-known member of the London School Board, and in various other ways has indicated an interest in the education of the people. Her object in writing this book is emphatically declared in the preface to be the promotion of the *popular study* of Social Science, and the volume has been planned with a special view to suitability for use as a reading book or class book in schools. Besides the twelve 'specific subjects' specially named in the New Code (Art. 16, (*b*), ii.), 'any other subject sanctioned by the Department may be taken, provided that a graduated scheme of teaching it be submitted to and approved by the Inspector of Public Elementary Schools. Mrs. Miller accordingly divides her treatise into three parts or stages according to Schedule IV. of the Code, and suggests that children in Standards V. VI. and VII. respectively, should once a week spend half-an-hour on one of the chapters in each 'stage,' and thus acquire a knowledge of the principles on which the well-being of society is based. The necessary 'scheme' for H. M. Inspector is ready to hand in the pages of contents, and many teachers would doubtless teach Social Economy as a 'specific subject' with as much readiness as any one of the specified dozen, were there any chance of completing the course. But as the years advance the number of scholars in Standard VII. will probably increase, and Mrs. Miller may hereafter, and under more favourable circumstances, know that this subject, which so vitally affects the general happiness of society, is commonly studied in the upper classes of our elementary schools. 'Economy' is at present one of the subjects prescribed for students in all training colleges, and Mrs. Fawcett's manual is one of those which teachers (men) prepare for the Christmas examination. There will thus be now no technical difficulty in the general adoption of this suggested 'specific' subject in boys' schools, and its value relatively to the others is worthy of consideration. In the colleges for female teachers Domestic Economy takes the place of Political Economy, but under the guidance of Mrs. Miller the head mistresses of every large Public Elementary School could easily instruct girls in Social Science wherever there is a considerable number in the upper standards. In many of the High Schools for girls Economy has already been systematically and successfully taught.

Disputed questions of political economy are professedly excluded from this elementary work. The author's sole endeavour has been to put plain facts so simply as to be perfectly intelligible to even young readers. In this effort Mrs. Miller has fairly succeeded. A clear style is not dependent upon the use of short words. 'Lucidity' and 'familiar terms,' even, are not necessarily synonymous expressions. We have been struck, however, with the marked prevalence of monosyllables. Take this 'summary' as a fair example:—

'Social Economy deals with man's daily life as it goes on in the world in which we exist. It aims at providing us with information which will be to us something like what a chart is to the sailor. At the same time we must strive to desire always to do what we ought; because it is of no more use to merely know what we should do, without trying to do it, than a chart would be to the sailor without the compass to guide him. But to know how we should act in many positions in life, and to desire always to do what is right, put together, will make us good and useful members of the human family, and give us our only chance of being personally happy and prosperous.'

Involved sentences are of very rare occurrence, and there are none whose meaning should be obscure to children in the advanced classes.

The Production, the Distribution, and the Exchange of Wealth are the three 'Stages' which Mrs. Miller has marked out, and in about eighteen chapters, under appropriate headings, has treated each of these three parts with a careful regard to the class of children intended to be interested. An occasional anecdote or an illustration from 'Robinson Crusoe' helps to enliven the subject, and at the same time to fix a principle in the memory. The progressive stages are felt to be inter-related, and any young student who proceeds surely from one to another will finally arrive at a goal which must be satisfactory in the consciously acquired knowledge of certain principles by which to direct his own conduct and that of his fellows for the general welfare of society. There is no special reference to the principles of religion in this volume beyond the expression of sentiments such as those which are cited above, and which recognise 'right' and 'wrong' without determining their basis. No objection to the treatise can be properly raised on this ground. Social economy can be profitably and independently taught, especially in schools where religious instruction is given. 'We may compare the needle of the compass, pointing always in one direction, to a *desire in the mind of a person to do what is right.* A constant unchanging wish to do what one believes one ought to do is not unlike the steadfast pointing of the compass-needle to the north. And this state of mind it is quite as necessary to possess if we would do our best with our lives, or perhaps even more so than a chart of the way of life.'

The moral welfare of a people is of far greater importance to their real happiness than the increase of mere material wealth; but we hold that an acquaintance with the economic principles explained in this book by the mass of the working-men would, as a mere appeal to their reason, tend to prevent such outrages as at this moment disgrace certain districts of this 'civilised' country. We trust that the object which Mrs. Miller had in view in composing this volume will be attained, for 'it is surely impossible that any thinking person can fail to see the need for teaching our children that prosperity will increase only in proportion as men exercise industry and thrift, advance in knowledge and skill, show respect for property, obedience to Government, forethought, honesty, trustworthiness, fidelity to contracts, and conscientiousness as citizens; and that the opposite course of conduct must cause poverty and misery to the community as certainly as the neglect of sanitary rules results in disease.'

A five-shilling volume cannot readily be adopted as a class-book in all schools, but we presume that another edition will be published at a price suitable to elementary schools. Pictorial illustrations might then be introduced with advantage. In its present form, however, these 'Readings in Social Economy' should command the attention of every practical teacher.

**Pope.** Selected Poems. The Essay on Criticism. The Moral Essays. By Thomas Arnold, M.A. London: Longmans and Co.

The author tells us in his introduction that he has not hesitated, considering that he hoped and expected the little book would fall into the hands of young people of both sexes, to 'suppress without mercy all passages, etc., the reading of which would clearly not tend to their edification.' The alterations are, however, as Mr. Arnold assures us, but slight, and perhaps, under the circumstances, boys, and even girls, are so curious, he is wise not to mark where alterations or omissions have been effected. This may be a comfort to some parents who know how differently poets of the last century expressed themselves from what their successors of the present time do.

The introduction consists of a few remarks as to who had prepared for school-work others of Pope's poems; a short account of the contents of the present volume; finishing with the dates and facts of Pope's life. The five poems are each of them prefaced by the argument and its divisions, and at the end of the book there are some useful notes, explaining the allusions, giving the meaning

of words when used with another than their ordinary sense. It is the constant publication of such works as this that is gradually rendering our own language an educational subject. All that we shall soon want will be a really good critical dictionary, which would enable a student to treat an English word much as a Greek scholar would treat a Greek one, and then the call for less of the dead languages and more of the living ones may receive some attention.

**Shakspere's 'Merchant of Venice.'** With Introduction, Notes, Examination Papers, etc. By Thomas Parry, F.R.G.S. London: Longmans, Green, and Co.

This edition of the 'Merchant of Venice' has been prepared to meet the requirements of the new Code, and to be a serviceable text-book for elementary school use. We have pleasure in saying that Mr. Parry has done his work well, and that the result of his labours is a thoroughly practical little manual. It commences with an Introduction giving an account of the life, writings, etc., of the illustrious author; and the text of the play is embellished with a series of pleasing and instructive illustrations. The notes—at the end—being simple and concise, are well adapted for the requirements of elementary schools, and the book is rendered more complete by the addition of a very serviceable appendix on the chief prefixes and terminations met with in the language.

**Warren Hastings.** By Lord Macaulay. Edited with Notes, etc., by S. Hales. London: Longmans, Green, and Co.

We have pleasure in recommending this little text-book to the notice of teachers. It is eminently practical, and contains within its covers all that is necessary for duly understanding the essay. The life of Lord Macaulay with which it is prefaced is well and brightly written, as is also the sketch of Indian history.

If any fault can be found with the notes at the end it is that they are almost too copious, and that fault most people will agree in thinking a very good one.

**Geometry and Mensuration for Schools.** Part I. By W. J. Browne, M.A., Lond. London and Manchester: John Heywood.

In this little book the elements of geometry and mensuration are supplied in a convenient and handy form, just suitable for school-work. The text given differs to no great extent from that occurring in the usual editions, but what alterations have been effected seem, on the whole, to have been made with skill and judgment. In one or two cases, however, the change for the better might be challenged, as, for instance, in the definition of the straight line. It seems to us rather doubtful if to define straight lines as 'those which cannot coincide with one another in two points without coinciding entirely' is better than the definitions more usually given: 'A straight line is that which lies evenly between its extreme points,' or 'A straight line is the shortest possible distance between its extreme points.' Mr. Browne's definition, though true enough if the *direction* of the straight lines was the only property to be taken into consideration, is, in our opinion, weak when the length of the straight lines is taken into account, for the objection might naturally be raised to it that two straight lines of *different lengths* can hardly be said to *coincide* with one another in the sense usually conveyed in geometry; they can scarcely be described as 'exactly filling the same space' if they are of different lengths.

In pointing out this weakness in the definition, we feel we are somewhat liable to be deemed hypercritical; but when the importance of having absolutely correct definitions is considered, it will be seen that what we have said simply shows how extremely difficult it is to effect in a time-honoured definition any alteration which is not equally open to objection.

The other modifications in definitions, axioms, postulates, and propositions are, as far as a pretty thorough overhaul will enable us to judge, remarkably well advised and well carried out; and the scope and variety of the exercises on mensuration at the end of the book will, to use a hackneyed, but in this case true expression, supply a want hitherto much felt in many schools.

**The Marvel Writing Copy Books.** Nos. 5, 6, 7, 8, 9. London and Manchester: John Heywood.

Teachers who like head-lines clearly written with no pretensions to ornate embellishment will find what they require in these useful little books, and the extreme lowness of their price puts them within the reach of all. Both in quality of paper and graduation of copies this series is a serviceable one.

**John Heywood's Home Lesson Books.** Compiled by Alfonso Gardiner. London: John Heywood.

Mr. Gardiner has done so much good, sound work in the past that any new venture from his pen merits careful consideration. The purport of this series—which is, by the way, adapted to the Mundella Code, 1883—is so clearly conveyed by the title that we need simply state that, in our judgment, the little volumes before us are excellent.

**Great Steps for Little Scholars; or, Geography Simplified.** London: John Heywood.

We should be sorry to see this book in the hands of either teacher or scholar. It is to be hoped that the former have sense enough to discard it. The book is almost entirely made up of questions and answers, and, educationally speaking, is next to useless.

**Action Songs for Children.** Second Series. Words and Music by J. Clifft Wade. Manchester and London: John Heywood.

Mr. Wade's melodies are fairly original, and are pleasant and attractive. This book is prepared for schools where part-singing is taught, and will be found useful in the upper divisions under the new code. The harmonies are rather crude, and occasionally incorrect, while the book abounds in misprints. It will be sufficient to refer to No. 1, where, in the last bar of the second score, a C natural in the accompaniment is meaningless, except it be intended for B natural. On the next page the first bar contains consecutive sevenths between first treble and bass, and a doubled seventh in the chord of the dominant, while in the voice parts of the next bar the notes to be sung together are not printed underneath each other. Also, in the last bar but one, an E natural in the accompaniment clashes harshly with the F in the second-voice part. A still more serious mistake occurs in No. 12, *third* bar of *third* score: an unendurable false relation of F *natural* in the bass with F *sharp* in the second treble. Mistakes such as these, scattered throughout the book, detract considerably from the value of an otherwise admirable little work.

**The Musician: A Guide for Pianoforte Students.** By Ridley Prentice. In Six Grades. Grade II. W. Swan Sonnenschein and Co., Paternoster Row.

The favourable impression made upon us by Grade I. of this series is fully sustained in the second part now before us. The selected pieces are admirably arranged, and Mr. Prentice's style is so interesting and full of enthusiasm and love for his art, that the reader cannot fail to catch the glow and warmth of sentiment pervading this excellent little manual, and the student who is wise enough to place himself unreservedly under the author's direction, and to follow him patiently and honestly, will acquire a solid foundation of musical skill, and a true intellectual appreciation of the musical beauties bequeathed to us by

the great classical masters. In the preface to the second grade some valuable hints are given to *teachers*, which might be studied and amplified with much profit by those who wish to train 'musicians,' and the principles laid down might be made available for even the youngest pupils. A knowledge of musical form was until very lately only accessible to the 'initiated,' but with such books as these within reach, the student has every facility afforded him of becoming in the best and truest sense a 'musician.'

**First, Second, and Third Readers.** London: Wm. Isbister.

These three new London Readers are 'intended to meet the views of a considerable number of teachers and inspectors,' and are professedly 'simpler than the existing series, and specially adapted to smooth over the difficulties of transition from the infant school, and also from one standard to another.' They will certainly serve this general purpose, but we cannot discover any *peculiar* method in the arrangement or in the gradation of the lessons or any other which can be claimed as a distinguishing feature of the new series. The books are nevertheless of an attractive character, being well printed and containing many and some really excellent engravings, which generally serve to illustrate the lesson. 'Harry Jones,' however, would scarcely recognise himself as represented on p. 44. The lessons are mostly short, consist of poetry and prose, the latter being conveniently divided into numbered paragraphs. The more difficult words are collected as spelling at the end of each lesson. It is probable that this new series will supersede the existing one, though it is difficult in a school readily to effect a change of this nature, even in favour of a book of acknowledged superiority.

**Latin Prose Composition and Translation, with Grammatical and Critical Papers.** By R. M. Millington, M.A. Relfe Brothers.

This little book is principally a reprint of the Examination Papers on these subjects, set by the two great Universities for their Junior Local Examinations since 1858 to the present time.

The author has gone out of his way to get each paper, with notes, exactly into a page. To do this, in the longer papers of translations from Latin into English, the type has had to be changed. The Accidence papers for the last few years have been added, the writing of which, even with the aid of a grammar and a dictionary, is almost the best way to prepare accidence for examination. By writing down declensions, etc., accurately, students get accustomed to notice the written appearance of words, and thus impress them on their memory far better than by learning them to repeat. Every teacher knows how hopeless it is to expect his pupils to write down what they know—no, nor a quarter of it, unless they have been well and constantly drilled in the practice of writing it.

At the end of the papers, there are a few pages containing most useful hints as to the difference between the genius of the English and Latin languages, showing how the English ought to be modified before translating into the other language. There is also an exhaustive little table of hypothetical, final, and other sentences, as well as one of the 'consecution of tenses.' Oratia obliqua receives due attention, and there are some original exercises, consisting of disconnected short sentences, for practice in this difficult figure of speech.

The book is well worthy of introduction to other schools than those preparing their younger boys for the Locals.

**The School-Attendance Guide.** By J. Hepburn Hume. London: Knight and Co.

The author of this volume is the clerk to the Ipswich School Board, and with his previous experience, both in the City of London and in the rural district of Harrow, should be in a position to give valuable information to all who seek to ascertain the best practical methods of securing regular 'school attendance.' There must be an increase of at least eight hundred thousand children in average attendance before the Education Acts shall in this matter have accomplished their purpose. Under the 'New Code,' this subject has become one of great financial interest to all concerned in the prosperity of any Public Elementary School, as the basis of the grant is now the 'average attendance for the year.' The last report of the National Union of Elementary Teachers is quoted to show that the Executive of that influential body believed that the 'question of School Attendance would become a vital one under the operation of the new principle regulating the payment of grants.'

Already managers are devising schemes for the 'internal' encouragement of regularity on the part of the children, but the 'external' arrangements which are possible and suitable to different localities and in accordance with the bye-laws of School Boards and Local Authorities are, we believe, fully set forth in Mr. Hume's manual. The minutest details for the guidance of School-Attendance Committees are given with clearness, and twenty-one schedules, shown by experience to be adapted to their various purposes, are printed in full. These must be of the greatest value in the application of the powers conferred upon Attendance Committees by the Education Acts.

With reference to 'Visitors'—a name to be preferred to 'Wardens' or 'Attendance Officers'—Mr. Hume objects to the employment of females, and insists upon the selection of men of unblemished character, fair education, good intelligence, and with a quiet but firm manner. Ex-policemen and soldiers are not likely to exhibit a patient and conciliatory manner. We agree with the author that 'move on' and 'eyes right' are bad watchwords for visitors, for, as Mr. W. E. Forster said, 'upon the manner in which these officers perform their delicate and difficult duties, the success of the compulsory clauses will depend.' A good salary offered at first, not as usual deferred until after long service, might at once secure men well qualified. The appointment of really able and intelligent men in the first instance will for some years to come be the truest economy.

There are many 'hints' in this book which are suggestive of favourable comment, especially those which refer to 'poor' children, on whose account chiefly compulsory education has been devised. We can only notice some thoughtful remarks about industrial schools, which 'many good and benevolent men' esteem so highly. Mr. Hume thinks that the enormous expenditure on this class of schools since 1870 'has done little good, if not positive harm.' 'Truancy is a difficult knot to unravel, but it must be untied patiently, and not cut by such wasteful and extravagant means as industrial schools afford. I have seen so many alleged incorrigible children cured of truancy by care and judgment that I decline to despair of any case. It is the parents who are most in fault,' and on them pressure and punishment should bear to the utmost, 'before resorting to other means.'

To every member of a School-Attendance Committee we commend this manual as a most useful if not indispensable guide.

**Two Lectures: The General Aims of the Teacher, and Form Management.** Cambridge University Press.

The first of these Lectures is by Dr. Farrar, late Head Master of Marlborough, and now Archdeacon of Westminster. It is simply charming. No teacher who begins to read will fail to continue to the end. The author suspects that some of his audience may, from his style, think he has reached his dotage, but he readily confesses to 'being in my anecdotage,' and the numerous facts and illustrations which he easily selects from his immense resources, in order to fix certain principles in the memory, must render this 'informal' lecture most fascinating to all who have any sympathy with the work of education. Twenty years' experience entitle Dr. Farrar to speak to the young graduates *ex cathedrâ*. 'MAXIMA *debetur*

*pueris reverentia*' is the sentiment which pervades his discourse, and he emphatically declares to assistant-masters that 'almost the first qualification which I should postulate would be *a sense of the importance, the dignity, the sacredness of your task*.' Teaching, training, discipline, is an art which may be acquired by most, but is naturally possessed in perfection by but few. *Experientia docet*—jocosely translated, 'experience does it'; but the lecturer solemnly advises those who, after a year's experience, feel they fail, to 'have the courage to choose another career.'

More than half of the Lecture refers to the considerations which underlie the teacher's work, and includes a section on corporal punishment, the advantage of which was, until recently, rarely questioned. 'I have as an every-day matter seen backs scored with red and blue weals, which, in these days, would secure in favour of the most mischievous street Arab a verdict in any police court.' The author, however, gives his 'deliberate testimony from six years' experience as Head Master of a school of more than 580 boys, that well-trained English boys may be guided by a thread; and that, in a good English school, corporal punishment may be so much minimised as to be wholly exceptional, and in some of the best schools almost entirely unknown.'

In the second part, Dr. Farrar offers some 'general remarks on matters intellectual and practical.' He shows in various ways that rational teaching is always more interesting than irrational, and laments the dreary and futile toil spent by hundreds of English lads for years together in *not* acquiring a single Greek verb. It is a 'literal fact' that 'under the present system of classical education,' many boys leave school, at sixteen or seventeen years of age, 'having received the worst of all possible educations, so far as mere intellectual equipment is concerned.' Sad, indeed, is such a conviction, such a testimony.

Mr. Poole's Lecture on 'Form Management' is more technical, and contains many very useful hints. The *character* of the teacher is of course the main thing insisted upon, but some valuable details are given which may be of great service to assistants in the Upper Schools. The publication of these lectures, as well as of those of Dr. Abbott, and Messrs. Fitch, Eve, and Sidgwick, by the University of Cambridge, will doubtless help to enforce the study of Education at least as an art, which may have reference to certain great facts or principles, physical, moral, and intellectual. Then certain traditions will lose their charm, and the Cambridge University will have helped to secure by the establishment of the Teachers' Syndicate, the prevalence of 'rational teaching' throughout the country.

**Supplementary Arithmetic.** By Rev. J. Hunter, M.A. London: Bell and Sons.

The author, in this little book, gives us evidently the result of his experience in teaching, at which he must be an adept. This is not his first effort, as he has not only published a revision of the admirable work on the subject, written many years ago by Bishop Colenso, and which probably taught arithmetic to half the middle-aged school men in England at the present day, but also has written an arithmetic of his own, which he terms Modern Arithmetic.

At the end of the work there are some well-arranged examination papers, the last two of which were actually set by the Civil Service Commissioners in a competition for clerkships. Such papers as these have had a good deal to do, no doubt, with showing Mr. Hunter, as an authority in arithmetic, the necessity of extending the subject beyond what was deemed necessary a few years ago. In modern papers we now find questions on scales of notation as well as problems of considerable difficulty. So many teachers, and we suppose examiners, insisting at the present time on the unitary method of solving certain questions, to the exclusion of proportion, Mr. Hunter has very ingeniously explained a method which practically uses a knowledge of proportion, and yet works with the simplicity of the unitary method. The great objection to the unitary method is the amount of time and space it occupies. Examinations are very often time-races as much as of knowledge and accuracy—especially in mathematical subjects. To introduce this method, Mr. Hunter begins his little book by a chapter on the denomination of a quotient, showing that a concrete quantity can only be divided by a concrete quantity of the same nature, and that the quotient is an abstract number. There is therefore no absurdity whatever in multiplying 4 tons by (10 shillings ÷ 5 shillings), since the expression within the parenthesis is simply a way of denoting the abstract number 2.

He therefore writes the complete ratio in a question in proportion in the form of a fraction, and says the denominators must be considered to have vanished. Since the fourth term of the proportion is the one required to be found, and this would be found in the denominator of the right-hand member of the equality, when written as fractions, the two members are inverted, and the operation becomes simply multiplying the corresponding term to that asked for by the fraction consisting of the other two terms placed in their proper position. We do not think that the introduction of this method can possibly prevent the necessity of thoroughly teaching the principle of proportion, and of insisting on the difference between quantities being connected together directly or inversely. Chapters III. and IV. are applications of proportion to interest, percentages, etc.

In Chapter V. there is a very simple method explained for averaging two rates, well worthy the attention of the student, which it would be scarcely fair to quote here.

In both the two competitive examination papers referred to, there are questions on scales of notation, which we trust may induce teachers to introduce this important part into their schools and expect examination thereon. We have always maintained that students know but little of the common denary scales (integral and fractional), until they have mastered the theory and practice of other scales. Whether a language will eventually have to be invented to enable us to talk in other scales is doubtful. Such, for instance as (say in the scale of 7), 4 times 4 are twosep two; or in the scale of 9, 5 times 8 are fournone four. We once knew an enthusiastic teacher of scales, who not only made his pupils say the multiplication-table in this kind of way, but also write them out very much as the ordinary multiplication-table is generally printed, in the form of a square.

The only thing to us that seems wanting is the pressing the importance of reciprocals. If students know why $\frac{2}{3}$ is called the reciprocal of $\frac{3}{2}$ and 2 of $\frac{1}{2}$, it is wonderful how many questions eventually can be solved in this way. To take an example:—Water increases $\frac{1}{10}$ in being converted into ice. By what fraction does ice decrease in being reconverted? Ans. The $\frac{1}{10}$ of water become $\frac{1}{9}$ of bulk of water when converted into ice. Therefore the ice $\frac{1}{11}$ of the bulk of the water—or decreases $\frac{1}{11}$ when reconverted.

We heartily recommend the book to all reading higher arithmetic, or preparing for competitive examinations. It is well printed, and not unreasonably dear.

**The Cambridge Series of Drawing Books.** In Twelve Parts. Chiefly designed by Robert Brydall, C. M. Glasgow School of Art. London and Glasgow: Cameron and Ferguson.

This is a good comprehensive series, well deserving of commendation. The books are carefully graduated, and lead the learner by easy stages from the study of straight lines through curved lines and simple ornament to the consideration of landscapes, figures, and flowers. The examples are much better both in subject and arrangement than many we have seen in books of a similar class. The directions given on the covers will no doubt prove very useful to those studying without a master, as will also the numerous guide-lines supplied to the examples throughout.

**Arithmetical All the Year Round Test Cards.** London: Moffatt and Paige, Warwick Lane.

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**The Hercules Furens of Euripides.** By F. A. Paley, M.A. Cambridge: Deighton, Bell, and Co.

Mr. Paley's name is about as closely connected with the Greek tragedians as that of Monroe with Lucretius, or Conington with Virgil. Everything that he publishes, therefore, is not only read with interest, but received as given forth with authority. The play is prefaced by an interesting introduction, in which he shows how the 'play unfolds to the student of mythology an important phase of that universal feature of all the great religions of old sun-worship.'

He even suggests that 'the twelve labours of Hercules, the greater part of which actually bear astronomical names, may represent the apparent passage of the sun through the twelve zodiacal signs.' At the same time, however true this may be, Mr. Paley reminds his readers that Euripides treats his solar heroes as historical beings. He then gives a short but useful sketch of the plot of the play, and concludes his preface with acknowledging the sources where he has gained some of the information given.

The notes are based on those in his entire edition of the plays of Euripides, published in the Bibliotheca Edition, and are wonderfully full and clear.

The play, no doubt, is a difficult one, but we shall expect to find that this separate edition of it will introduce it into many schools, where hitherto only the Hecuba and Medea, and perhaps Hippolytus, have been read.

To add that it is one of the series issued from the University of Cambridge press, is sufficient guarantee that it will be well and accurately printed.

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